CANADA'S PERSPECTIVE ON

CLIMATE CHANGE

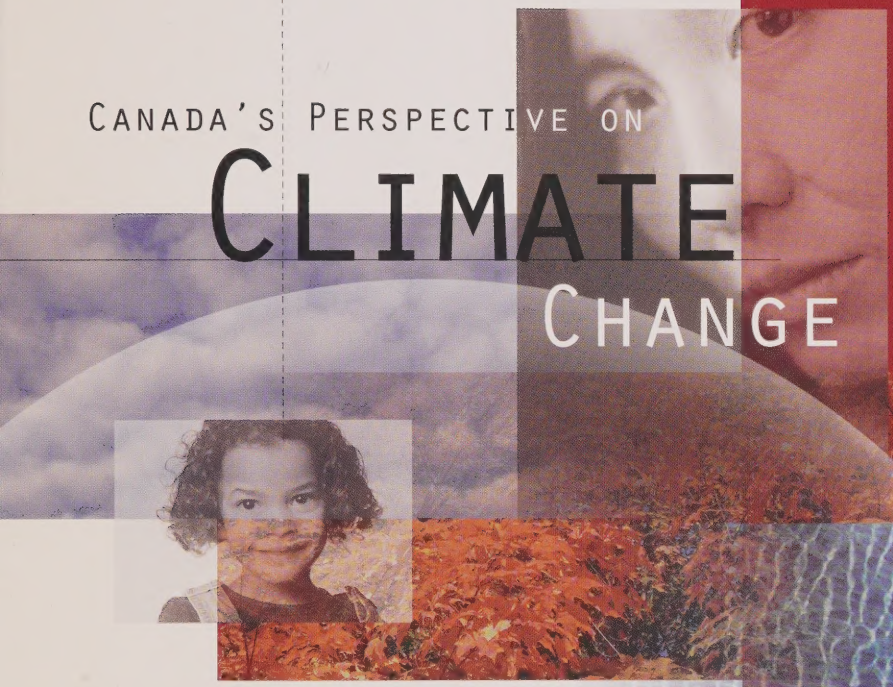
PERSPECTIVE DU CANADA SUR

LES CHANGEMENTS CLIMATIQUES

Government of Canada Gouvernement du Canada

Canada

CANADA'S PERSPECTIVE ON CLIMATE CHANGE



TAKING ON THE CHALLENGE

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The series *Canada's Perspective on Climate Change* is made up of three booklets: *Taking on the Challenge; Science, Impacts and Adaptation;* and *A Compendium of Canadian Initiatives.* Copies of all three documents are available by visiting the Government of Canada's climate change Web site (www.climatechange.gc.ca) or by calling the toll-free line 1 800 O-Canada (1 800 622-6232). For access outside Canada, please consult the Canada site (www.canada.gc.ca/directories/infor_e.html) for international toll-free numbers.

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La perspective du Canada sur les changements climatiques: relever le défi

Ministers' Message

Our Concern for the Future

As a party to the United Nations Framework Convention on Climate Change and a signatory to the Kyoto Protocol, Canada is taking action today to safeguard the future of our environment, our economy and the world. We are addressing climate change through a variety of domestic actions, ranging from improving our understanding of the science and impacts of climate change to implementing mitigation and adaptation programs. Most important, we are preparing for an even greater effort in the new millennium.

Canada's northern location, sensitive ecology and socio-economic structures make us particularly vulnerable to climate change, which underscores the need for action. Yet Canada also faces some unique climate change challenges. Ours is a vast country with a relatively small population by world standards. Enormous distances separate many of our cities, and this presents challenges for transportation, telecommunications and energy distribution. As well, Canada's winters are typically long and cold. Our economy is sophisticated and increasingly knowledge-based, but significant components continue to be resource-intensive and export-oriented. Significant amounts of energy are required to keep industries and businesses operating.

All of these factors combine to make Canada one of the most energy-intensive countries in the world. And our population and economy are growing significantly, which means that energy consumption and greenhouse gas emissions will continue to rise unless additional action is taken.

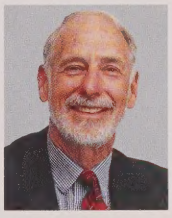
Canada is answering these challenges with ingenuity and entrepreneurship. We have developed world-leading expertise in energy-efficient residential and commercial buildings. We have developed more efficient industrial processes and equipment, as well as technologies that are allowing us to use alternative fuels and renewable sources of energy. We have improved our agricultural and forestry practices, so that more atmospheric carbon is stored in our cropland and forest ecosystems instead of being emitted into the air.

These are important steps in meeting our climate change goals, but the challenge before us is significant. Canada must strengthen and build on existing climate change actions and broaden them to involve all Canadians. We must make critical decisions on how we will reduce our greenhouse gas emissions over the next decade and adapt to changes in our climate and environment in the longer term.

This booklet explains Canada's initial response to the Kyoto Protocol – a unique solution-building process that is giving Canadians from all walks of life the opportunity to provide input to a national climate change strategy. More important, it provides information on Canada's climate change mitigation efforts to date – broad-based actions designed to improve our use of energy, introduce alternative forms of energy, and develop and deploy innovative climate change technologies. Without these actions, carbon dioxide emissions alone would have been four per cent higher in 1997 than actual levels.

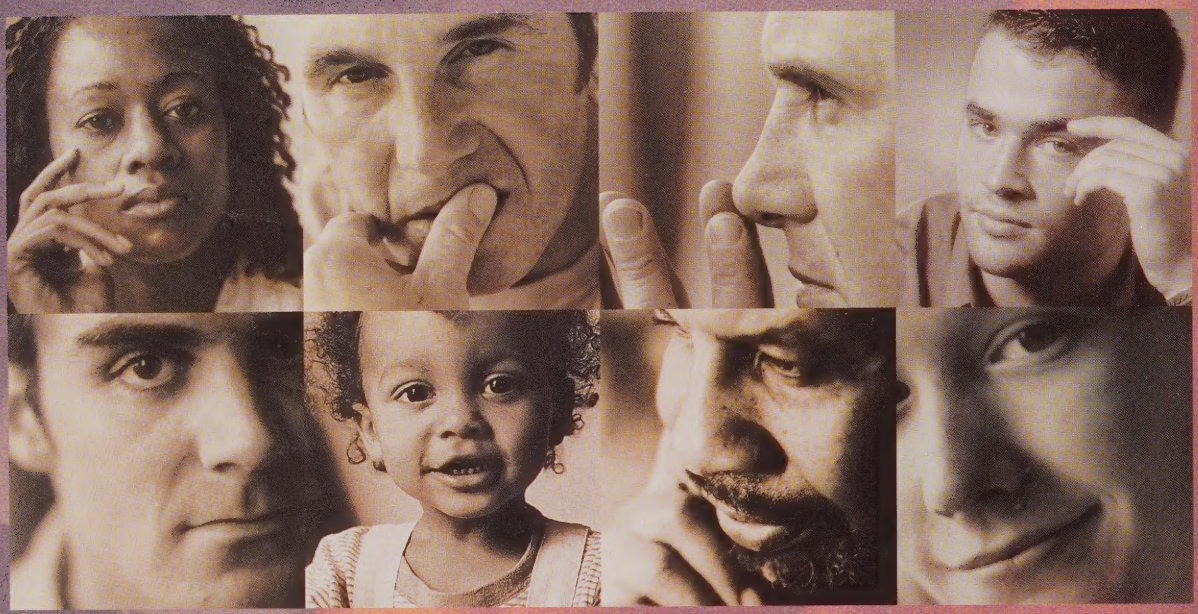
The Government of Canada is acting in partnership with provincial, territorial and municipal governments. Industry, the commercial sector, institutions and non-governmental organizations are important and effective partners. Communities and individual energy consumers are also taking action to reduce greenhouse gas emissions.

Progress is being made but more needs to be done. Through domestic consultations and international negotiations, Canada will devise a climate change strategy that builds on current and past actions, reflects our circumstances and allows us to meet our environmental and economic goals. Canada is part of the climate change problem, and we will be part of the solution.



David Anderson
Minister of Environment

Ralph Goodale
Minister of Natural Resources



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1 Climate Change: Challenges and Opportunities

Climate change has been called the most significant environmental issue the world has ever faced, and with good reason. Projections show that a continued warming of Earth's temperature could trigger a wide range of changes in our climate – changes that could have serious consequences for our environment, our health, our economy and our children's future.

Scientists around the world have been studying climate change for more than a decade, and most have concluded that immediate action is needed.

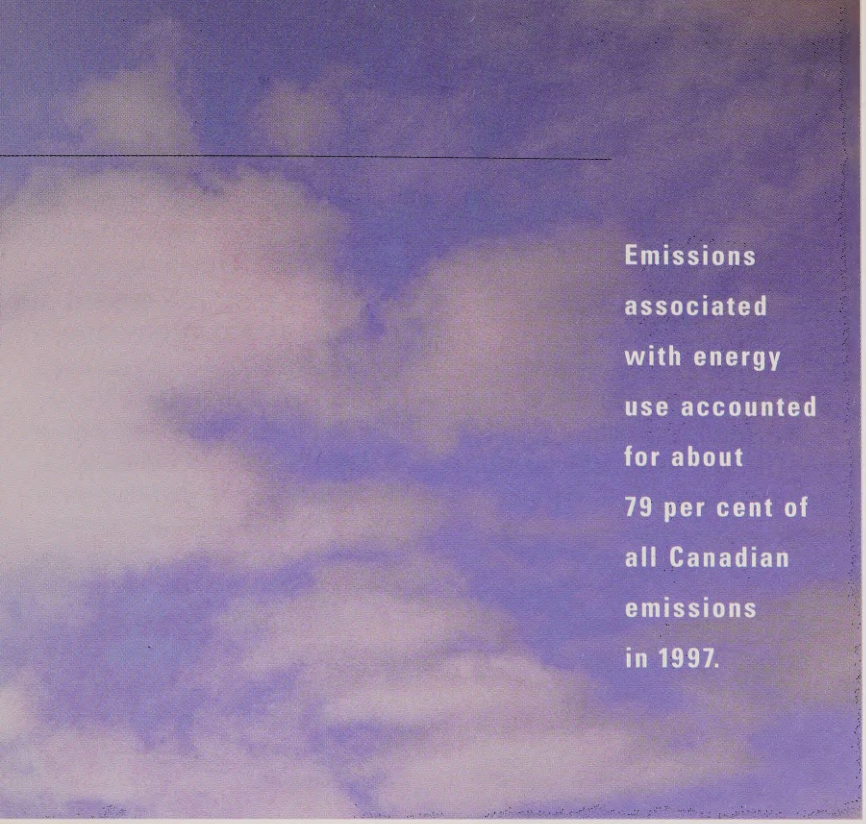
Our atmosphere is a complex mixture of gases that trap the sun's heat near Earth's surface, similar to how the glass of a greenhouse traps the sun's warmth. Without these "greenhouse" gases (GHGs), the sun's heat would escape and the average temperature of Earth would be 33 degrees cooler (–18%C), too cold to support life as we know it.

Earth's climate has fluctuated for thousands of years, but at a rate that has allowed humans, animals and plants to adapt to the changes. But evidence now suggests that human activities are adding a lot more GHGs to the atmosphere and that the rate of change is accelerating. Our consumption of energy to provide heating, cooling and electricity to buildings, to transport people and goods, and to power industrial processes is the biggest part of the problem. Other human-driven activities – including certain land use practices, deforestation and our use of landfills for waste disposal – also contribute greenhouse gases to the atmosphere.

Canada's Greenhouse Gas Story: A Synopsis

Canada produces a small portion – about 1.8 per cent – of the world's total greenhouse gas emissions (1990 baseline year). Nevertheless, Canadian emissions are relatively high on a per capita basis, second only to the United States. Several factors contribute to this high per capita production:

- Canada is a land of extremes and contrasts. Our land mass extends roughly 5 300 kilometres from east to west, the distance between Paris and New York, and nearly 4 600 kilometres north to



south. As a consequence, Canada faces significant transportation challenges for both people and goods.

- Few nations can match our climatic diversity. Overall, Canada is characterized by short, intense summers with wide temperature variations and long, cold winters, which place a heavy demand on energy consumption, especially for heating buildings.
- Canada has the second highest population growth rate among industrialized countries, due mainly to immigration. This population growth is driving up the demand for goods and services and leading to infrastructure changes, such as increases in the number of dwellings, commercial buildings, roads and vehicles, all of which contribute to greater demands for energy and more greenhouse gas emissions.
- Canada's economy is increasingly knowledge-based, but significant components continue to be resource-intensive and export-oriented, which means there is an enormous demand for energy to produce and export products and to keep industries and businesses operating. Our economy is also growing at a rate of about 1.9 per cent per year, which further increases energy demand.

These and other factors – such as extensive market integration with the United States in critical areas like fossil fuel and electricity exports, and vehicle and equipment manufacturing – present Canada with unique challenges in responding to climate change in a North American context. Despite concerted efforts to reduce our greenhouse gas emissions (see, "Canada is Taking Action" on page 10), Canada's emissions

Leading Canadians Urge Action on Climate Change

Twenty-five recipients of the Order of Canada participated in the National Forum on Climate Change, sponsored by the National Round Table on the Environment and the Economy in early 1998. After hearing a variety of viewpoints about climate change and weighing the evidence carefully, they concluded:

"We, the members of the National Forum on Climate Change, believe that climate change will touch the life of every Canadian. Decisions taken today on this complex and controversial issue will have implications for our communities, our children, and future generations .... Every Canadian has a role to play in reducing greenhouse gas emissions. The time for action is now."

The full text of the declaration is available on the Round Table's Web site (see inside back cover for the address).

grew by 13.4 per cent between 1990 and 1997, a compound increase of about 1.8 per cent per year.

Nevertheless, Canada has achieved important progress in bringing emissions under control, even while our economy has expanded. In 1997, the economy grew three times faster than greenhouse gas emissions. This is only a first step toward achieving a net reduction in emissions and is a positive sign that Canadian actions to mitigate climate change are having an impact. For example, without energy efficiency improvements (as measured by changes in energy intensity) achieved in the residential, commercial, industrial and transportation sectors, Canada's carbon dioxide emissions alone would have been four per cent higher in 1997 than actual levels. Actions now in effect are projected to reduce greenhouse gas emissions by some 60 megatonnes by 2010.

There is another side to Canada's greenhouse gas story. We are home to a considerable portion of the world's forest area and wetlands, which can act as storehouses for large quantities of atmospheric carbon. The management of these resources is a significant consideration in Canada's approach to climate change.

Canada is Part of the Solution

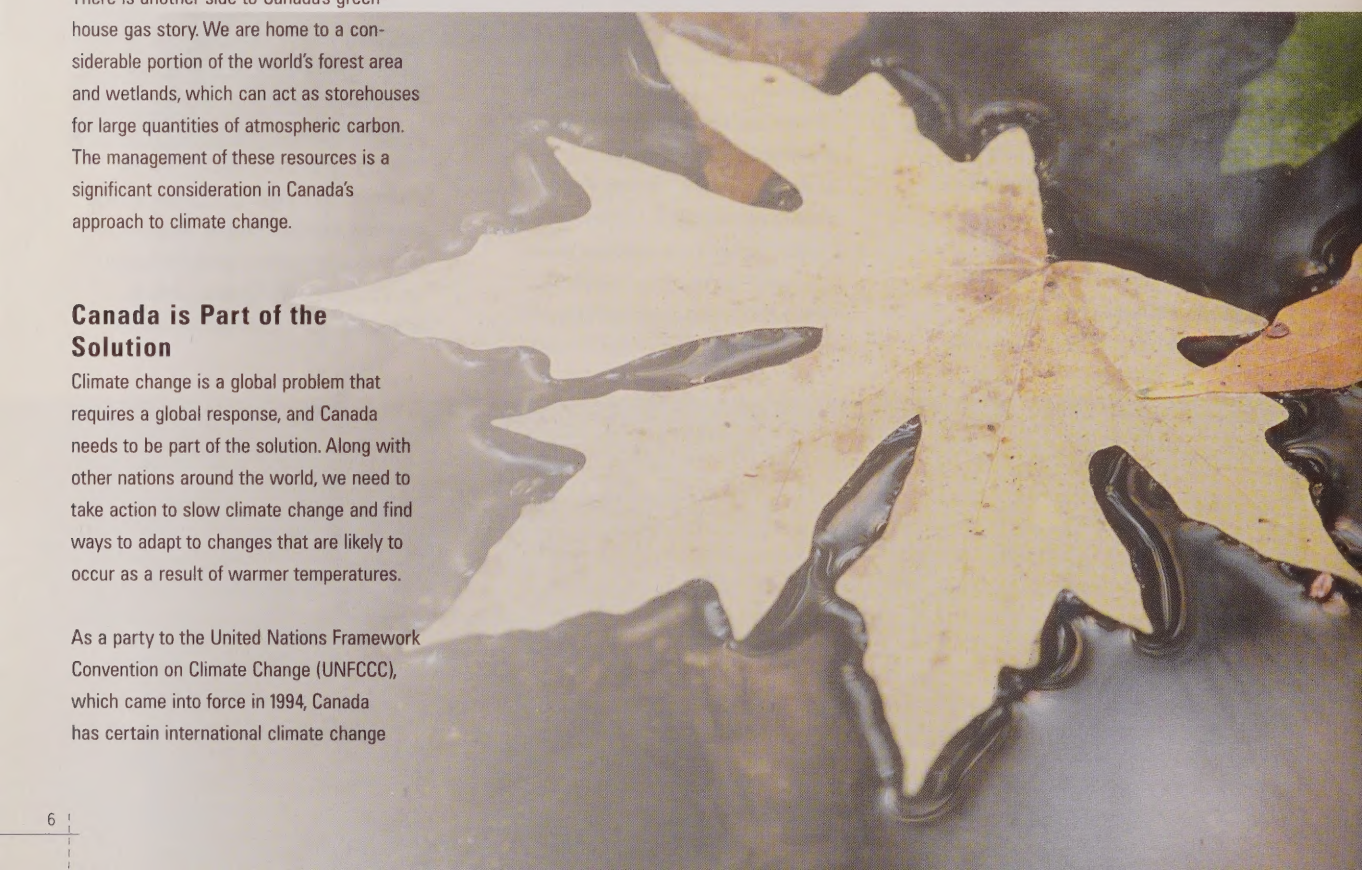
Climate change is a global problem that requires a global response, and Canada needs to be part of the solution. Along with other nations around the world, we need to take action to slow climate change and find ways to adapt to changes that are likely to occur as a result of warmer temperatures.

As a party to the United Nations Framework Convention on Climate Change (UNFCCC), which came into force in 1994, Canada has certain international climate change

obligations. Over the past several years, governments, along with industry, institutions and other stakeholders, have been working to reduce greenhouse gas emissions. While Canada and many other industrialized countries are making progress, greater efforts are required.

In December 1997, at the Third Conference of the Parties to the UNFCCC, some 160 nations negotiated an international climate change agreement – the Kyoto Protocol. The Protocol sets out emission reduction targets that will be binding on parties when the agreement is ratified. Canada's Kyoto target is to bring our greenhouse gas emissions down to six per cent below 1990 levels by the period between 2008 and 2012. Based on current projections, this means that Canada will need to cut its emissions from business-as-usual over the next 8 to 12 years by at least 25 per cent. Most developed nations face a similar challenge.

The UNFCCC also obligates Canada to formulate programs that will support improved understanding of climate science and impacts, and facilitate the development of climate change adaptation strategies. These strategies will reduce our vulnerability to the impacts of climate change and position us to take advantage of the opportunities. Science, impacts and adaptation efforts, together with mitigation programs, are a critical part of Canada's climate change response.



Taking on the Challenge

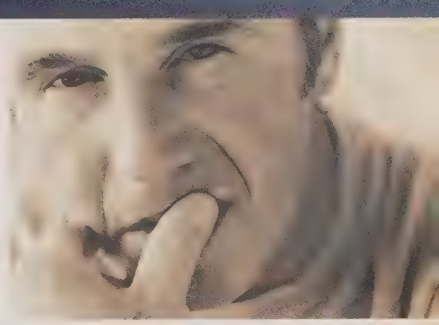
Achieving our climate change goals will be a significant challenge for Canada, particularly since our economy and population are growing and the demand for energy continues to rise. At the same time, climate change presents us with many opportunities for economic growth, jobs, increased trade and technological advancement. There could also be associated benefits in terms of reduced atmospheric pollutants, a cleaner, healthier environment and a better quality of life for many Canadians.

Canada's response to climate change includes a number of elements:

- We have launched a unique process to develop a national strategy to meet our climate change goals while ensuring continued economic growth and prosperity.
- We have strengthened existing climate change programs and activities to reduce emissions and launched new ones.
- We are supporting the development and deployment of new climate change technologies.
- We continue to support research into the science and impacts of climate change and to develop comprehensive adaptation strategies.

This booklet explains the process Canada has undertaken to develop a climate change implementation strategy that will provide for actions by all citizens, businesses, industries, governments and other organizations and institutions. It also provides information on Canada's climate change mitigation actions to date and on Canada's role in international climate change fora.

This booklet is by no means an exhaustive account of Canadian climate change mitigation programs. A listing of programs delivered by the federal, provincial and territorial governments is provided in a separate document in this series, *A Compendium of Canadian Initiatives*. A third document, *Canada's Perspective on Climate Change: Science, Impacts and Adaptation*, describes the science of climate change, its potential impact on Canada and our adaptation strategies.



2 Building A National Strategy

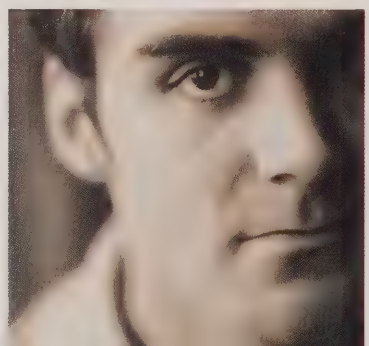
Reducing Canada's greenhouse gas emissions will be a difficult challenge that will involve all sectors of society and affect different regions of the country in different ways.

Canada has established a National Climate Change Secretariat to manage and support the national engagement process and the development of Canada's National Implementation Strategy on Climate Change. See the inside back cover for the Secretariat's Web site address.

Two overriding principles shape our approach to climate change:

- First, we must be effective in reducing emissions but we must act in ways that are compatible with sustained economic growth and increased Canadian competitiveness.
- Second, we must be inclusive and fair, ensuring that no region of the country is called upon to bear an unreasonable burden.

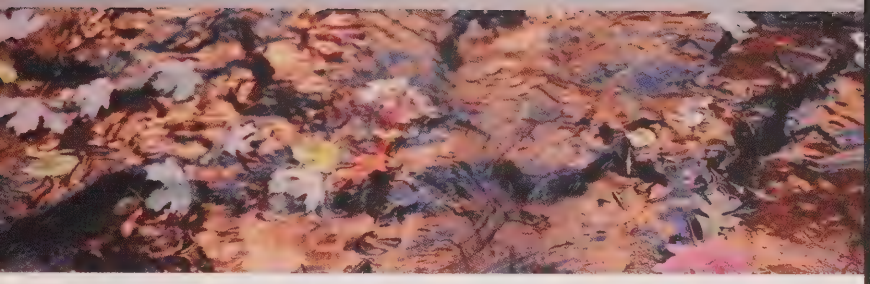
Using a pragmatic, step-by-step approach, Canadian governments, industry, environmental groups, the scientific community and individuals are working together to build a national climate change strategy.



The National Climate Change Process

Sixteen expert committees, called Issue Tables or Groups, were established in mid-1998 to examine various aspects of climate change and the Kyoto Protocol from a broad range of perspectives. Some 450 Table members – high-calibre experts from governments, the private sector, environmental groups and universities – are analysing and proposing made-for-Canada solutions to the climate change challenge.

This inclusive, collaborative and transparent process will ensure that Canada explores the full range of options for reducing emissions and makes decisions based on the best advice possible. It will help us develop a climate change strategy that is creative, flexible, comprehensive and respects Canada's particular circumstances.



Climate Change Issue Tables

- Agriculture and Agri-Food
- Analysis and Modelling (Group)
- Buildings
- Credit for Early Action
- Electricity
- Enhanced Voluntary Action
- Forest Sector
- Industry
- Kyoto Mechanisms
- Municipalities
- Public Education and Outreach
- Science, Impacts and Adaptation
- Sinks (Carbon Sequestration)
- Technology
- Tradeable Permits (Working Group)
- Transportation

As a starting point, each Table was asked to produce a "foundation paper" that:

- described and analysed the current state of affairs, from a climate change perspective, for their sector or issue;
- identified specific challenges and opportunities presented by climate change; and
- identified issues that needed to be researched to better understand the relationship between present and future emission levels.

With the foundation papers serving as a framework for further review and consultation, Issue Tables then tackled the job of developing short-, medium- and long-term options for Canada's response to climate change. The Tables have commissioned research and called on other experts to contribute to these discussions. Federal, provincial and territorial ministers of energy and the environment will meet in early 2000 to consider the options put forward and how they can be brought together in a National Implementation Strategy that will guide Canada in the years ahead.

For more information on Canada's national climate change process, including copies of the papers produced by each Issue Table, visit the National Climate Change Secretariat's Web site (see the inside back cover for the address).

3 Canada is Taking Action

The Kyoto Protocol has heightened awareness of climate change and the need for comprehensive and sustained action. In reality, Canada has been addressing the problem for more than a decade by investing in climate change research, developing and deploying new energy-efficient technologies, encouraging Canadian consumers and businesses to become more energy wise, and promoting the use of alternative energy sources throughout the economy.

The Learning Game

Across Canada, high school and university students are making critical decisions on the future of the global environment. It's all part of a stimulating educational experience called the Global Change Game.

Up to 70 students in each participating school are challenged to make decisions that will determine the next 30 to 40 years of Earth's history.

With funding of $73,625 from the CCAF, the game's creator – Global Change Game Inc. of Winnipeg, Manitoba – is developing new material that will focus on climate change.

This section of the document provides a snapshot of Canada's climate change mitigation efforts, which cover the full spectrum of economic activity, from our vital natural resources sector to industry, businesses and institutions, communities, governments and individual energy consumers. These are important actions, but more needs to be done. With this in mind, Canada will continue to develop a climate change response that engages all sectors of the economy and individuals in finding ways to reduce greenhouse gas emissions and achieve our goals of a healthy environment and a vibrant economy.

The Government of Canada has played a leadership role in addressing climate change, working in partnership with others. Federal investments in climate change total $200 million each year. Provincial, territorial and municipal governments, utilities and the private sector are also making significant investments in climate change mitigation efforts.

The various elements of Canada's climate change response described here include:

- the Climate Change Action Fund (CCAF);
- programs in the areas of renewable energy, alternative fuels, energy efficiency and agriculture;
- support for technology development and deployment;
- voluntary efforts by industry and businesses;
- government leadership, including actions to reduce greenhouse gas emissions from government operations.

Climate Change Action Fund

The CCAF was established by the Government of Canada in 1998 to help Canada develop its response to the Kyoto Protocol. It supports actions to reduce greenhouse gas emissions as well as efforts to increase understanding of the impacts, costs and benefits of the Protocol's implementation and various implementation options open to Canada.

How Much CO_2 Do You Produce?

The Sustainable Development Research Institute at the University of British Columbia is developing a new computer-based tool that will help Canadians determine how their day-to-day activities produce carbon dioxide, how much they produce and what they can do about it.

It's called the Canadian CO_2 Calculator, and it's being developed through a partnership of educational institutions, governments and the private sector, with support of $222,875 from the CCAF.

The CCAF is investing $150 million over three years. The Fund is also leveraging significant private-sector and other government funding, allowing it to make the most of opportunities to reduce our greenhouse gas emissions and adapt to the impacts of climate change.

The CCAF has four components:

- Public Education and Outreach supports projects that build public awareness and understanding of climate change and encourage action to reduce GHGs. These projects are helping Canadians address climate change.
- Science, Impacts and Adaptation supports further research to advance our knowledge of the magnitude, rate and regional distribution of climate change and its impact on Canada. A better understanding of the risks of climate change will help us formulate adaptation strategies that will reduce our vulnerability to negative impacts and increase our ability to take advantage of opportunities.
- Technology Early Action Measures (TEAM) supports cost-effective technology projects that could lead to reductions in greenhouse gas emissions. This is the largest component of the CCAF, a reflection of the importance of new technology development to Canada's climate change response.
- Foundation Analysis supports the national climate change process and the sound analysis of options to reduce Canada's greenhouse gas emissions.

Examples of CCAF projects are highlighted throughout this document. To learn more about the Fund and individual projects, visit the Government of Canada's main climate change Web site (see inside back cover for the address).

With funding from the Technology Early Action Measures component of the CCAF and the Technology Partnerships Canada program, Iogen Corporation of Ottawa, Ontario, in partnership with Petro-Canada of Calgary, Alberta, is developing and demonstrating a cost-effective process for producing ethanol from biomass. With Iogen's technology, every litre of ethanol substituted for gasoline will reduce carbon dioxide emissions by 70 to 90 per cent compared with gasoline.

CCAF Explores Science, Impacts and Adaptation Issues

The CCAF is helping Canada tackle its international obligations related to climate change science, impacts and adaptation.

For example, the CCAF has funded research to improve Canada's global and regional climate models; to develop a national plan for observing our climate; to better quantify carbon sources and sinks in our forests and soils; and to enhance our understanding of past changes in the Arctic climate.

Research is also being funded to determine the sensitivity of Canada's agriculture, forest, fisheries and water resources to changes in climate; to understand the impact of climate changes on our health and infrastructure; to better determine the economic costs of climate impacts; and to begin to develop options for adapting to the changes expected.

Renewable Energy Offers Environmental and Economic Promise

Canada is blessed with an abundance of renewable energy sources that produce low or no emissions and can make an important contribution to our climate change goals. These resources – solar, wind, hydro, earth and biomass energy – can also contribute to Canada's long-term energy security and to economic growth and job creation.

Canada is committed to accelerating the development and commercialization of renewable energy technologies, many of which are now market-ready and cost-competitive (we already produce some 60 per cent of our electricity from large-scale hydro facilities). To this end, the Government of Canada spends more than $15 million a year promoting and developing renewable energy. Its Renewable Energy Strategy is a blueprint for cooperative action with a broad range of stakeholders, including industry, communities, provincial and territorial governments, and environmentalists.

The Renewable Energy Deployment Initiative, or REDI, is a major component of the strategy. Launched in April 1998, REDI provides financial incentives to encourage businesses, government departments and others to install proven, cost-effective space and water heating and cooling systems that use renewable energy sources.

RETScreen™, a Canadian-developed computerized tool for assessing renewable energy projects, is now used in more than 100 countries around the world.

The Renewable Energy for Remote Communities (RERC) Program is accelerating the deployment of renewable energy technologies in remote Canadian communities that are not connected to the main electricity grid. RERC provides communities with the tools, information and knowledge needed to assess the feasibility of renewable energy

systems, select the most cost-effective technologies and implement projects.

To encourage renewable energy investments, Canada has changed its tax rules to create an essentially level playing field for all energy investments in Canada. As well, government and industry information campaigns are raising consumer awareness of the availability, environmental benefits and cost-effectiveness of renewable energy systems for the home and commercial/ industrial installations.

Increasing the use of renewable energy in federal government operations is another key objective of our Renewable Energy Strategy. An important milestone was achieved in December 1997, when two federal departments began purchasing electricity generated from renewable energy sources for their facilities in the province of Alberta. This pilot project will save more than 10 000 tonnes of carbon dioxide emissions annually.

Canada is also encouraging the development of advanced renewable energy technologies, such as wood-pellet stoves, photovoltaic systems for cold climates, and liquid fuels from forest and agricultural wastes.

More information on the Renewable Energy Strategy is available through Natural Resources Canada's Web site (see inside back cover for the address).

On the Road to Alternative Transportation Fuels

The transportation sector is the single largest source of greenhouse gas emissions in Canada, and emissions from vehicles are growing faster than from any other sector. Switching to no- or low-emission alternative transportation fuels (ATFs) is an important part of the answer to this challenge.

Governments in Canada are working with the ATF industry and major vehicle manufacturers to expand the use of such fuels as propane, natural gas, methanol, ethanol, electricity and hydrogen, and fuel cells. Activities include developing and promoting factory-built alternative transportation fuel vehicles, vehicle conversion kits and refuelling equipment.

The Government of Canada offers financial incentives for the purchase or conversion of natural gas vehicles and for natural gas vehicle refuelling equipment. Support is also provided to the industry for marketing and awareness activities and for R&D to fill technology gaps.

Gasoline manufacturers are contributing to the climate change effort by formulating low-level blends of ethanol and gasoline, which can be used in most gasoline engines to help reduce vehicle emissions. These blends, known as E10, are now widely available across Canada. Through technological improvements, vehicle manufacturers have consistently met the Canadian Average Fuel Consumption (CAFC) levels for passenger cars and light-duty vehicles, despite increasing demand for larger vehicles and more powerful engines.

Source: Vision Quest Windelectric Inc. A 600-kW wind turbine at Belly River, Alta.

A number of exciting Canadian projects are exploring the transportation fuels of tomorrow. One of the more promising technologies is the fuel cell.

Canada developed the world's first hydrogen-powered fuel cell transit bus, which was launched in Vancouver, British Columbia, in early 1993. This pilot project now involves three buses in Vancouver's transit fleet powered by a fuel cell designed and manufactured by a Canadian firm – Ballard Power Systems – which has established itself at the international forefront of this field. The development of this zero-emission technology is a model of how government-industry partnerships can lead to reduced emissions and new business opportunities (for more information on Canada's fuel cell activities, see the box on page 17).

All major North American car manufacturers now have fuel cell programs.

Montréal Puts Electric Vehicles to the Test

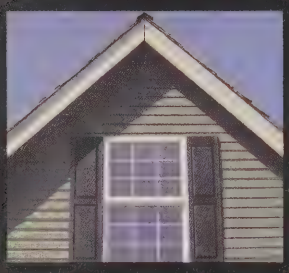
Zero-emission electric vehicles can help Canada reduce greenhouse gas emissions and tackle the problem of urban smog – but are they ready for the market?

With funding support of $420,000 from the CCAF, the Montréal 2000 Electric Vehicle Fleet Project is testing some 40 electric vehicles in private and public sector fleets to determine whether they can be an alternative to conventional gasoline vehicles in an urban environment.

Homeowners Make the Climate Change Connection

Homeowners across the province of Saskatchewan are finding out how they can reduce greenhouse gas emissions and save money by increasing the energy efficiency of their homes.

The Sun Ridge Group – the official delivery agent for EnerGuide for Houses in Saskatchewan – has received funding of $105,050 from the Climate Change Action Fund to help spread the word about the economic and environmental benefits of energy efficiency in the home.



Automakers have indicated they will have limited production fuel cell cars on the road by 2004.

Electric vehicles are also expected to play a role in Canada's transportation energy future. Canadian researchers are developing and testing a range of technologies, including light-weight and longer-lasting batteries and hybrid electric vehicles, which use an electric motor to reduce the demand placed on the primary energy source (usually an internal combustion engine).

Energy Efficiency – A Cornerstone of Canada's Climate Change Response

One challenge shared by all sectors of Canadian society is to use energy more efficiently.

Significant progress has already been made. As noted earlier, carbon dioxide emissions would have been four per cent higher in 1997 than actual levels if not for energy efficiency improvements achieved across the economy. These improvements are saving Canadians about $4.4 billion per year in energy costs and have made Canadian companies more competitive by lowering their operating expenditures. In other words, energy efficiency is good for the economy as well as the environment.

Canada is devoting significant resources to the development of energy-efficient technologies that will help us achieve our climate change goals. For information, see the "Technology – The Opportunity Side of the Climate Change Challenge" on page 15.

In April 1998, the Government of Canada built on existing programs by creating the Office of Energy Efficiency, a one-stop service for energy efficiency. Through its many programs for the residential, commercial, industrial and transportation sectors, some of which are

highlighted here, the Office of Energy Efficiency is showing Canadians how to save energy at home, at work and on the road.

Residential programs – Making our homes more energy-efficient

EnerGuide for Houses is a program to give Canadians the facts they need to make informed decisions about energy efficiency when renovating an existing home or buying a new one. It builds on the popular EnerGuide label, which provides consistent and reliable information on the relative energy efficiency of major household appliances and room air conditioners. An energy efficiency rating system is also in place for heating, ventilating and air conditioning equipment.

Reno$ense is a government-industry marketing initiative that encourages Canadians to incorporate energy efficiency into their home renovation plans. The R-2000 Home Program encourages the building of energy-efficient houses that are environmentally friendly and healthy to live in.

Canada regulates minimum performance levels for more than 20 energy-using products that account for 65 per cent of residential energy use. These regulations have greatly improved the energy efficiency of new household appliances and equipment.

Industrial and commercial programs – Partnerships with the private sector

The Industrial Energy Efficiency Initiative is a voluntary program that helps Canadian industry identify energy efficiency potential, establish targets, implement and manage programs, report on progress and celebrate accomplishments relating to energy efficiency.

A similar approach is taken in the commercial and institutional sectors, where the Energy Innovators Initiative encourages Canadian organizations to make energy efficiency investments throughout their operations to lower costs and reduce greenhouse gas emissions.

The Canadian Industry Program for Energy Conservation (CIPEC) helps industrial task forces set and achieve targets for improving energy intensity in their sectors. CIPEC members have effectively achieved their target of improving energy intensity by 1 per cent per year from the 1990 base year, during a period in which average annual economic growth was 2.3 per cent. Carbon dioxide emissions have essentially been stabilized at 1990 levels.

Providing incentives for action

The Commercial Building Incentive Program offers financial incentives to encourage Canadian building owners to incorporate energy-efficient technologies and practices in designs for new commercial, institutional and multi-unit residential buildings. Financial incentives have also been available in the commercial/institutional sectors for energy efficiency retrofit pilot projects that can be replicated in other similar facilities.

Taking the energy efficiency message on the road

Canada's Auto$mart Program provides motorists with helpful tips on buying, driving and maintaining their vehicles to reduce fuel consumption and greenhouse gas emissions. A companion program – FleetSmart – helps fleet managers identify and implement energy-efficient practices.

More than 380 fleets, representing about 96 000 vehicles, have registered with the FleetSmart Program.

EnerGuide for Vehicles is a program to inform buyers of passenger cars and light-duty trucks of the opportunity to buy the most fuel-efficient vehicle that meets their needs. Tools include the EnerGuide fuel consumption label affixed to all new vehicles for sale in Canada, the *Fuel Consumption Guide* for consumers, and the annual EnerGuide Awards for manufacturers of the most fuel-efficient vehicles.

For more information on programs delivered by the Office of Energy Efficiency, visit its Energy Efficiency Home Page (see inside back cover for the address).

Technology – The Opportunity Side of the Climate Change Challenge

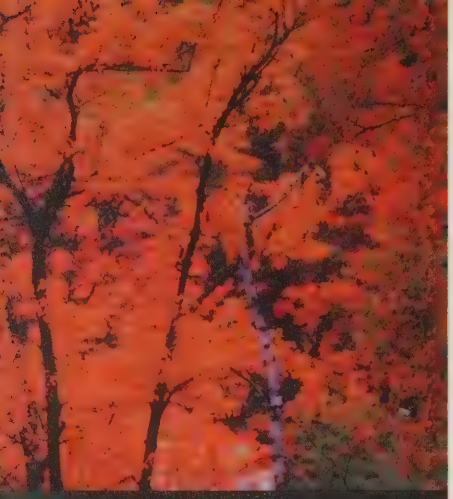
The world will need innovative technological solutions to slow the trend of climate change and to adapt to those changes we cannot avoid. Canadian governments, industry and research institutes have been working to ensure that Canada develops some of the best solutions. Research and development (R&D) activities encompass everything from energy-efficient technologies for homes, businesses, communities and industry to alternative transportation fuels, renewable energy and advanced hydrocarbon technologies.

Ridesharing Program Will Reduce Emissions

A British Columbia-based non-profit society is laying the groundwork for a national rideshare network, with funding support of $181,000 from the Climate Change Action Fund.

Commuter Connections is involved in providing rideshare programs for some 60 000 commuters in the lower mainland area of B.C. and on Vancouver Island. It's now proposing to establish a rideshare program at 20 post-secondary educational institutions across Canada that will result in 2 000 four-person carpools.

In addition to increasing students' awareness of the economic and environmental costs of single occupancy vehicles, the project – called Climate Connection – is expected to reduce atmospheric air pollution by more than 28 000 tonnes per year and deliver environmental benefits worth some $28 million annually.



Businesses Encourage Employees to Say "Count-Me-In"

More than 15 Canadian companies are helping their employees say "count-me-in" as part of the climate change response by sponsoring information sessions in the workplace.

Two-hour interactive workshops will be delivered to as many as 2 700 Canadians in their workplace during the initial phase of this project, which is supported with funding of $150,000 from the Climate Change Action Fund.

In some instances, government researchers and scientists provide the genesis of a technology idea, which is then developed, demonstrated and commercialized by the private sector. In other cases, government knowledge, laboratory expertise and financing have supported companies in developing a technology from the drawing board through to the marketplace.

This partnership approach is serving Canada well. The new technologies being developed are not only helping us meet our domestic climate change goals, but also contributing to our economic priorities, such as improved industry competitiveness, new business lines, new jobs and export opportunities.

One approach to technology partnerships is the unique federal interdepartmental Program of Energy Research and Development (PERD), which comprises an extensive network of scientists, engineers and technology managers who identify priorities, discuss energy technology issues, review programs and perform R&D. PERD supports and complements a wide range of energy science and technology initiatives undertaken by 11 federal departments and agencies in Canada. These include:

- the Industry Energy Research and Development Program, which is working with industrial partners to develop the next generation of energy-efficient processes and products for industry;
- the Canadian Centre for Housing Technology, which is working with industry to develop the next generation of energy-efficient technologies and systems for new and retrofit housing; and
- the Community Energy Systems Program, which encourages an integrated approach to community energy planning and project development.

Working with the City of Windsor, Ontario, the Community Energy Systems Program facilitated the construction of a district energy project with the potential to prevent 40 000 tonnes of carbon dioxide emissions per year.

Another Canadian technology initiative – Technology Partnerships Canada – has invested approximately $73 million in climate change projects, leveraging some $500 million in private sector investments. More information is available on the program's Web site (see inside back cover for the address).

Many technology success stories have emerged from partnerships involving Canadian industry, universities, government laboratories and other countries. For example:

- Conserval Engineering's Solarwall™, the world's most efficient solar heating system, is now being exported around the world. The Solarwall™ is an air collector that uses solar energy to preheat ventilation air for buildings.
- Iogen Corporation has developed technology to make fuel ethanol from woody biomass. With financial support from the Government of Canada, Iogen has recently joined forces with Petro-Canada, one of the country's largest petroleum companies, to build Canada's first commercial-scale wood-to-ethanol plant in Ottawa.
- Fuel cell technology developed by Ballard Power Systems, with support from government and others, has attracted the interest of automakers like Ford and Daimler-Chrysler, which are investing heavily in the technology.

The first Solarwall™ installation at a federal facility – CANMET Energy Technology Centre, Bells Corners, Ontario.

To learn more about Canadian energy technology programs, visit the Web site of Natural Resources Canada's Energy Technology Branch (see inside back cover for the address).

Industry Leads the Voluntary Approach

Hundreds of Canadian businesses have taken steps to become more energy-efficient. Many of these companies have filed action plans with Canada's Climate Change Voluntary Challenge and Registry (VCR) Inc., an organization whose mandate is to encourage all sectors of the economy to voluntarily limit or reduce greenhouse gas emissions (a companion registry in Quebec is called Écogeste). More than 900 organizations have registered with the VCR Inc., including companies that generate more than 70 per cent of Canada's business and industrial greenhouse gases.

Industrial companies in particular have embraced the voluntary approach to reduce greenhouse gas emissions. In many instances, their efforts are showing that responsible environmental action can be a significant contributor to the bottom line:

- DuPont Canada Inc., a leading producer of chemical products, reduced its energy use by almost 30 per cent between 1990 and 1996, providing cumulative savings of $45 million as well as emission reductions.
- Dofasco Inc., one of Canada's leading steel producers, reduced its greenhouse gas emissions by about 27 per cent between 1990 and 1997.
- Enbridge Consumers Gas, Canada's largest natural gas distributor, achieved a 30 per cent reduction in emissions between 1990 and 1997.
- Over the past decade, Syncrude Canada Ltd. of Edmonton, Alberta, a producer of oil from oil sands, has decreased its energy intensity by 12.5 per cent and cut greenhouse gas emissions by 23 per cent per unit of production.

Canada Strengthens Its Commitment to Fuel Cell Technology

Many scientists believe that fuel cell technology is a key long-term answer to greenhouse gas emissions. With the help of electrocatalysts, fuel cells convert the chemical energy in hydrogen and oxygen into an electric current that is channelled to a load (for example, an electric motor). The only by-product emitted from this process is pure water.

Canada is a world leader in the field. To maintain this position and further strengthen the industry's research and development capabilities, the Government of Canada, in collaboration with the private sector, has launched the $30-million National Fuel Cell Research and Innovation Initiative.

A National Fuel Cell Research Facility will be established at the National Research Council Canada's (NRC) Innovation Centre in Vancouver. The NRC, Natural Resources Canada and the Climate Change Action Fund will support a research and technology demonstration and deployment program. As well, a university research fund will be established to build on work being done by the NRC and another Canadian science institution – the Natural Sciences and Engineering Research Council.

The development of fuel cell technology is an excellent example of how government-industry partnerships can lead to environmental breakthroughs and opportunities for new jobs and economic growth in Canada:

- The Government of Canada has provided more than $73 million to support fuel cell and fuel cell systems development in Canada. With the National Fuel Cell Research and Innovation Initiative, the total federal commitment comes to more than $100 million.
- Another key partner – the province of British Columbia – has provided more than $21 million to the industry. Other provincial governments have also supported the development of fuel cell technology. For example, the province of Quebec jointly funds many hydrogen projects led by Natural Resources Canada.
- Research, development and commercialization activities are being led by the private sector. Daimler-Chrysler, Ford and Ballard Power Systems have already invested nearly $1 billion in an alliance to address the high costs and risks associated with developing this technology.

Communities Are "Building for Success"

More than 60 municipal governments across the country have accepted a challenge from the Federation of Canadian Municipalities to reduce greenhouse gas emissions. The task is twofold: to reduce emissions from municipal operations to 20 per cent below 1990 levels within 10 years, and to reduce emissions on a community-wide basis by at least six per cent in the same period.

It's called Partners for Climate Protection – Building for Success, and it's one of many public education and outreach initiatives supported by Canada's Climate Change Action Fund. CCAF funding for this project is $789,418 over three years.

A key objective of Partners for Climate Protection is to make communities more aware of opportunities to reduce emissions. As well, research is being done on the risks climate change poses to municipal infrastructure and related adaptation costs. Community pilot projects and retrofits will be supported.

Visit the VCR Inc.'s Web site (see inside back cover for the address) for information about voluntary climate change actions by Canadian industry, governments and institutions.

Canada's forest industry is also providing important national leadership in making the transition to lower-carbon operations. By the end of 1997, greenhouse gas emissions from the pulp and paper industry had been reduced to 19 per cent below 1990 levels: during this time, production increased. One of the main reasons was a strategic decision to replace fossil fuels with biomass fuels, primarily wood waste generated from timber operations. Today, some 75 per cent of the energy used by pulp and paper mills comes from renewable sources. Since 1989, the pulp and paper industry's use of fuel oil has been cut by nearly 50 per cent and its energy consumption per tonne of production has dropped by 4 per cent.

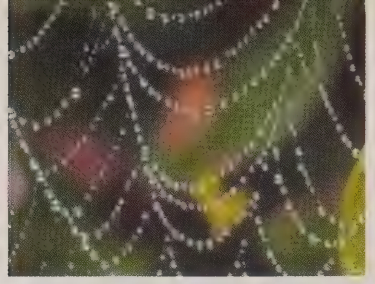
For more information on Canada's forest industry and climate change, visit the Canadian Forest Service's Web site (see inside back cover for the address).

Agricultural Producers Are Doing Their Part

Canada's agricultural sector is a major focus of climate change efforts for several reasons:

- agricultural production is sensitive to climate changes;
- the industry is very important to the Canadian economy;
- the agriculture and agri-food sector is a major source of GHGs; and
- the sector also has the potential to be a carbon sink.

At least 10 per cent of Canadian emissions come from the agricultural sector. What's more, the primary greenhouse gases produced by agriculture and agri-food activities – nitrous oxide and methane –



are more powerful than carbon dioxide (the predominant greenhouse gas) in terms of their global warming potential. On the positive side, many scientists believe Canada's agriculture and agri-food sector has the potential to be a carbon sink – in other words, with appropriate farming practices, agricultural soils may absorb more atmospheric carbon than the sector emits.

Canada's federal and provincial agriculture departments and agriculture associations are working together to raise awareness of climate change and potential mitigative actions. For example, farmers are being informed about how their choice of farming practices can reduce emissions of carbon dioxide. The approaches being championed include: using farm machinery more efficiently, insulating certain farm buildings, drying crops in the field rather than through mechanical processes, and developing biomass-derived fuels such as ethanol and biodiesel.

Farmers are also learning about and adopting practices that can increase the amount of carbon stored in agricultural soils, practices such as reduced or no tillage of cropland, the addition of nutrients to the soil, elimination of summer fallow and the restoration of wetlands. Proven agricultural practices are being encouraged to economically and effectively reduce methane emissions from livestock and manure, and to avoid conditions that favour the "denitrification" of soil, which results in nitrous oxide emissions.

For more information on Canadian agricultural practices that can reduce greenhouse gas emissions, visit Agriculture and Agri-Food Canada's Web site (see inside back cover for the address).

Governments Show Leadership

Canadian governments at all levels are demonstrating leadership on the climate change issue.

For example, the Government of Canada – the country's largest single enterprise when measured in operational terms – is working to get its own house in order. The government has developed an action plan to reduce greenhouse gas emissions from federal operations by at least 20 per cent from 1990 levels by the year 2005. Through building retrofits, improved boiler systems, better fleet management and strategic green power purchases, the Government of Canada is on track to meet this target. Emissions from federal operations are estimated to have declined by 16 per cent between 1990 and 1997.

Canada's provincial and territorial governments also have dedicated climate change programs. Some of these governments operate toll-free telephone lines and distribute free publications that give people information on energy efficiency. Others help departments and agencies take advantage of third-party financing to implement energy efficiency retrofits of hospitals, schools and public buildings. Regulations are used in some jurisdictions to test the effectiveness of vehicle exhaust systems, and support may be provided to energy efficiency demonstration programs and renewable energy projects.

For more information on provincial, territorial and municipal climate change initiatives, see the list of Web sites on the inside back cover.

Across Canada, local communities are taking action on climate change. Home energy audits, ridesharing, vehicle emissions testing and tree planting programs are just some of the community-based responses to climate change.

The Government of Canada's EcoAction 2000 program is helping by providing financial assistance and advice to non-profit Canadian groups that want to undertake local environmental projects. EcoAction 2000 offers free information on transportation issues, hundreds of practical environmental tips for Canadians and their communities, and special resources targeted at youth and educators. The program's Web site is on the inside back cover.

Toronto is an example of a major Canadian city that has made a considerable commitment to energy conservation. In fact, the United Nations has recognized Toronto as one of the world's leading cities in combatting climate change. Many other communities share this commitment:

- The City of Regina, Saskatchewan, has reduced its energy consumption for five consecutive years, and city-based carbon dioxide emissions have dropped by 13 per cent from 1988 levels.
- With support from the Climate Change Action Fund, the town of Perth, Ontario, has launched the Perth CO2000 Model Community Project, a community-wide effort to reduce greenhouse gas emissions by more than 20 per cent.
- The community of Oujé-Bougoumou, Quebec, was awarded a UN Global Citizen award for its district heating system, one of several installed in Canada with support from the Government of Canada's Community Energy Systems Program.
- The City of Whitehorse, Yukon, is constructing a 10-kilometre trail as part of its plan to promote alternative transportation and non-motorized movement between subdivisions and downtown.

People Taking Action

Individual Canadians can make a real difference when it comes to climate change. Federal, provincial and territorial governments are providing Canadians with climate change information and tips on how they can reduce energy consumption, save money and help create a healthier environment and economy for Canada. Here are some of the quick and easy steps people can take:

- **Check the Energuide label when buying appliances or vehicles to get the most energy-efficient model.**
- **Turn off lights, appliances, televisions and computers when they're not needed.**
- **Avoid idling your vehicle.**
- **Install low-flow showerheads and fix leaky or dripping faucets.**

4 International Activities

Canada will continue to play an active role in international climate change negotiations.

Our primary goals are:

- to establish clear and effective rules for implementing the Kyoto Protocol that promote sustainable growth for all parties; and
- to help meet the climate change needs of developing countries.

Establishing Clear and Effective Rules

Canada is committed to defining rules for implementing the Kyoto Protocol that will provide Parties with a wide range of opportunities to meet their targets.

Progress was made on implementation issues at the Fourth Conference of the Parties to the United Nations Framework Convention on Climate Change, held in Buenos Aires in November 1998. Parties agreed to a two-year Plan of Action for moving forward on implementing the Kyoto Protocol, with final decisions expected at the Sixth Conference of the Parties to be held in The Hague in the fall of 2000.

Among the implementation issues of particular concern to Canada are the cooperative mechanisms included in the Kyoto Protocol. These mechanisms are intended to help countries achieve their Kyoto targets by allowing them to participate in international cooperative activities that benefit the global environment. While Canada will aim to achieve a majority of its reductions domestically, we also anticipate that some reductions will be obtained through:

- an international emissions trading regime, which will permit Canada and other industrialized countries to buy and sell emission reduction credits among themselves;
- the Clean Development Mechanism (CDM), which will allow for credited reductions for projects that take place in developing countries; and
- Joint Implementation (JI), through which industrialized countries will be able to share credits for projects that take place in other industrialized countries that have adopted emission reduction targets.

Canada's objective is to ensure that the various criteria agreed upon for implementing these mechanisms bring maximum economic, social and environmental benefits to all participating countries. In particular, we are promoting an active role for Canadian industry in greenhouse gas emission reduction projects abroad.

To enhance Canada's capacity to take advantage of the opportunities offered by the CDM and JI, the Government of Canada established a Clean Development Mechanism and Joint Implementation Office. The office:

- acts as the day-to-day federal government contact point on the CDM and JI, with links to other federal government programs, expertise and resources;
- facilitates Canada's participation in the CDM and JI by assisting Canadian project proponents with host country approval and by exploring strategic cooperation arrangements with host countries; and
- provides technical guidance to companies participating in the CDM and JI.

The office works closely with several federal government departments and agencies involved in climate change issues to identify opportunities for Canadian industry, non-governmental organizations and governments to become involved in CDM and JI projects. More information is available by visiting the office's Web site (see inside back cover for the address).

CIDA Supports Climate Change Project Abroad

The Canadian International Development Agency (CIDA) provides $492 million in funding for 51 climate change projects around the world. One such project is designed to improve industrial energy management and reduce greenhouse gas emissions in southern Africa.

The five-year project, implemented by AGRA Monenco Atlantic, is helping countries in the region introduce new industrial energy management practices. CIDA funding for this project totals more than $11 million.

Engineers, accountants and technicians are being trained in analysing energy use, identifying energy saving opportunities and determining the economic feasibility of various actions. As well, local organizations and institutions are receiving technical assistance and technology transfer.

A Pakistani two-stroke auto-rickshaw converted from gasoline to natural gas.

Responding to the Needs of Developing Countries

Canada believes it is critical to respond to the needs of developing countries and to help them address the challenge of climate change, both in reducing their greenhouse gas emissions and in adapting to climate change. Any investments made in this regard will pay dividends in the form of a healthier world environment in the 21st century.

The Government of Canada is supporting a number of initiatives to transfer climate change technologies to developing nations to help them meet their energy needs in ways that balance environmental and economic priorities.

For example, with assistance from the TEAM component of the CCAF, Canada is investing in a project to convert 30 to 45 gasoline-operated, two-stroke auto-rickshaws in Pakistan to operate on natural gas. The conversion project will be undertaken by Yugo-Tech Inc. of Mississauga, Ontario, and will include training of technicians, rickshaw operators and local officials in Pakistan. Converting to natural gas will reduce annual carbon dioxide emissions from each rickshaw by 21 per cent. Potential carbon dioxide reductions of 370 000 tonnes could be achieved over the next few years from converting Pakistan's estimated 220 000 rickshaws and motorcycles (which can also use this technology). This technology has the potential to convert 1.5 million rickshaws in Asia.

Canada is also supporting a project by the Canadian firm Powerbase Automation Systems Inc. to demonstrate its automated turbine control unit at five small-hydro plants in China. The demonstration sites alone are expected to result in carbon dioxide savings of 30 000 tonnes yearly. The project could lead to retrofits of 55 additional sites, with greenhouse gas reductions equal to almost 250 000 tonnes of carbon dioxide a year.

Science, Impacts and Adaptation

Canada also will continue to participate in international science fora, particularly the World Climate Research Programme (WCRP), established by the World Meteorological Organization, the International Council for Science and the Intergovernmental Oceanographic Commission of UNESCO; and the Intergovernmental Panel on Climate Change (IPCC), established by the World Meteorological Organization and the United Nations Environment Programme. The IPCC is assessing the state of our understanding of the climate system and the environmental impacts, response options, and social and economic aspects of climate change. Canadian scientists have contributed to the WCRP's and IPCC's groundbreaking work and will continue to do so in future.

5 Safeguarding Our Future

Canada has laid a strong foundation for a comprehensive and effective climate change response in the 21st century, and we are committed to building on that foundation in the coming months and years.

We will continue to work toward a National Implementation Strategy on Climate Change that will allow us to meet our climate change obligations while maintaining strong economic growth and a high standard of living. When completed, this strategy will provide a basis for future actions by governments and others.

The National Implementation Strategy will build on the momentum achieved to date through a broad range of domestic climate change programs and initiatives. Key to the success of these efforts has been the involvement of all governments – federal, provincial, territorial and municipal – industry and businesses, environmental groups, communities, individual consumers and other stakeholders. We will continue to engage all Canadians and all sectors of society in meeting the challenge.

Canada is also committed to working in partnership with other nations – developed and developing – to ensure an effective global response to the climate change challenge. Canada will strive to ensure that the framework for implementing the Kyoto Protocol is in place by the Sixth Conference of the Parties – a framework that provides parties with options for achieving their targets. We will also work to improve our collective understanding of climate change science and impact and adaptation issues, and to develop appropriate responses.

By thinking globally and acting locally, adopting innovative practices, and collaborating across jurisdictions, industrial sectors and regions, Canada will achieve its economic and environmental goals, fulfil its international obligations, and show global leadership on the climate change issue.

For More Information

The Canadian Web sites listed below offer information on Canadian climate change programs and initiatives. Most of them also provide links to other climate change sites. For more information and a copy of a climate change kit with ideas on how you can reduce greenhouse gas emissions, please call the toll-free line 1 800 O-Canada (1 800 622-6232). For access outside Canada, please consult the Canada site (www.canada.gc.ca/directories/infor_e.html) for international toll-free numbers.

National Climate Change Web Sites

Government of Canada Climate Change Site: http://www.climatechange.gc.ca
National Climate Change Secretariat: http://www.nccp.ca
Environment Canada's Green Lane: http://www.ec.gc.ca
    EcoAction 2000: http://www.ec.gc.ca/ecoaction
Natural Resources Canada: http://www.nrcan.gc.ca/
    Canadian Forest Service: http://www.nofc.forestry.ca/climate
    Energy Technology Branch: http://www.nrcan.gc.ca/es/etb
    Office of Energy Efficiency: http://oee.nrcan.gc.ca
    Office of Energy Research and Development: http://www.nrcan.gc.ca/es/new/oerd.htm
Agriculture and Agri-Food Canada: http://www.agr.ca/envire.html
Clean Development Mechanism and Joint Implementation Office: http://dfait-maeci.gc.ca/cdm-ji
Health Canada: http://www.hc-sc.gc.ca/english/climate.htm
Industry Canada – Technology Partnerships Canada: http://tpc.ic.gc.ca
Transport Canada: http://www.tc.gc.ca/envaffairs/english/climatechange.htm
National Roundtable on the Environment and the Economy: http://www.nrtee-trnee.ca
Voluntary Challenge and Registry Inc.: http://www.vcr-mvr.ca

Provincial/Territorial/Municipal Web Sites

Alberta: http://www.climatechange.gov.ab.ca/
British Columbia: http://www.elp.gov.bc.ca/epd/epdpa/ar/
Manitoba: http://www.gov.mb.ca/environ/index.html
New Brunswick: http://www.gov.nb.ca/environm
Newfoundland and Labrador: http://www.gov.nf.ca/env/Labour/OHS/default.asp
Northwest Territories: http://www.gov.nt.ca
Nova Scotia: http://www.gov.ns.ca
Nunavut: http://www.inac.gc.ca/nunavut/index.html
Ontario: http://www.ene.gov.on.ca
Prince Edward Island: http://www.gov.pe.ca/te/index.asp
Quebec: http://www.mrn.gouv.qc.ca
Saskatchewan: http://www.gov.sk.ca
Yukon: http://www.gov.yk.ca
Federation of Canadian Municipalities: http://www.fcm.ca
International Council of Local Environmental Initiatives: http://www.iclei.org/iclei.htm

CANADA'S PERSPECTIVE ON

CLIMATE CHANGE

SCIENCE, IMPACTS AND ADAPTATION

Government of Canada
Gouvernement du Canada

Canada

The series ***Canada's Perspective on Climate Change*** is made up of three booklets: ***Taking on the Challenge; Science, Impacts and Adaptation;*** and ***A Compendium of Canadian Initiatives.*** Copies of all three documents are available by visiting the Government of Canada's climate change Web site (**www.climatechange.gc.ca**) or by calling the toll-free line **1 800 O-Canada** (**1 800 622-6232**). For access outside Canada, please consult the Canada site (**www.canada.gc.ca/directories/infor_e.html**) for international toll-free numbers.

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Ce document est également offert en français sous le titre
La perspective du Canada sur les changements climatiques: science, impacts et adaptation

Ministers' Message

Actions Based on Sound Science

It is now widely recognized that Earth's climate is changing, and that the impacts of climate change will be felt across national borders, ecosystems and economic sectors in the decades ahead. Scientists have concluded that the balance of evidence suggests discernible human influence on global climate. In addressing climate change, governments need to make responsible decisions and take actions that are based on sound scientific knowledge.

Climate science is a complex and rapidly evolving field of investigation. Scientists in Canada and around the world are engaged in a broad variety of endeavours to better understand Earth's climate. As well, scientific involvement in issues related to climate is becoming increasingly integrated with other issues. The data generated by computer models that project future climate conditions are used by researchers studying the potential impacts of climate change on areas such as water resources, health, food production, forestry, wildlife, and urban infrastructure. Our impacts researchers are increasingly working on projects that integrate the effects of climate change across sectors or regions to get a more realistic picture of what climate change will mean for Canadians.

Science also has a role to play in guiding the strategies proposed to lessen the impacts. These strategies include both efforts to reduce the amounts of greenhouse gases in the atmosphere (mitigation), and plans to cope with climate change and its impacts (adaptation). By signing the Kyoto Protocol, Canada has demonstrated its commitment to moving forward domestically and internationally on meeting its reduction targets, and to preparing to face the changing climate of the 21st century. We will also continue to support the scientific investigation of climate change so that we can increase our understanding of what is to come.

In Canada, the research agenda concerning climate change is influenced by the issues that are most crucial to our country and by our international commitments under the United Nations Framework Convention on Climate Change. We recognize the crucial need to maintain, and in some areas extend, our capacity in the fields of climate science, impacts and adaptation. We are taking steps to ensure that the required investments are made to foster this capacity.

It is clear that the world must take action. It is also clear that sound science must continue to be a foundation for national and international decision-making.

David Anderson
Minister of Environment

Ralph Goodale
Minister of Natural Resources

Contents

Introduction

As the world prepares to enter the 21st century, there may be no greater challenge that we face than responding to the changes in Earth's climate. Our climate has supported human life on the planet for millennia, providing the opportunity for our species to prosper and flourish. Now we are confronting the reality that human activities have been changing our atmosphere, and have altered the balance of Earth's natural climate system.

Scientists studying climate change continue to conduct research into Earth's climate processes, to monitor the global climate and the factors which influence it, and to develop models to help us anticipate our future climate. Others from a broad range of fields are involved in studying the impacts of climate change on both natural and socio-economic systems. A consensus has emerged that our world is getting warmer, and that the additional warming and associated changes in the climate system projected to occur over the 21st century will have serious consequences for humanity and the global environment.

The growth of human societies and technologies over the past few hundred years – and especially our use of fossil fuels – may have triggered a series of far-reaching environmental, social and economic consequences. The continuing work of scientists will remain crucial, providing us with the knowledge we need to develop effective responses to the challenge of climate change.

1 Earth's Changing Climate

Like many aspects of the natural world, Earth's climate is a delicate balance, a complex system in which many factors interact to produce regional climates and weather systems. In essence, climate is the result of a global heat distribution system, driven by solar energy from the sun, and modified by Earth's rotation and its major geographic features.

The Main Elements of Earth's Climate

The sun is the main player in the climate system. It emits solar radiation which heats Earth. Heating from the sun is greatest in the equatorial regions, with the intensity of solar radiation decreasing toward the poles. This sets in motion the circulation patterns of the winds and oceans that influence the development of weather systems.

The atmosphere acts like a protective blanket, keeping Earth warm and screening out many of the sun's harmful rays. Made up of several distinct layers, the atmosphere acts as a storehouse for various gases and particles. Both the make-up of the atmosphere and air circulation patterns have a major effect on climate and weather systems, including precipitation patterns.

The oceans cover about three-quarters of Earth's surface. Water both gains and loses heat more slowly than air, thus moderating the climate of coastal areas. Ocean currents help to distribute heat around the globe by moving warm tropical water toward the poles and cooler water back toward the equator.

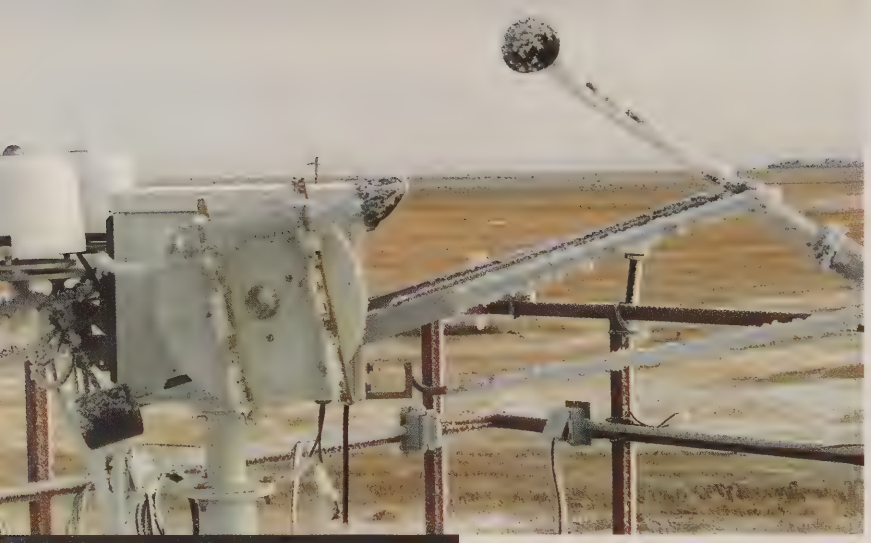
Water, in all its forms, plays an important and complex role in climate processes. The average amount of precipitation an area receives (as rain or snow) is an important part of its climate. Water also helps to cool the surface (through evaporation), reflect the sun's energy (as clouds or ice cap) and keep Earth warm (as water vapour). Even icebergs can affect the weather as they cool the air and oceans around them.

Land masses and their features – such as forests, deserts and mountains – can influence both global and regional climate in a number of ways. Land heats and cools more quickly than water, affecting the flow of air currents and the formation of weather systems. The type of land surface affects the amount of the sun's energy that is reflected or absorbed by Earth. Light areas such as snowpack are very reflective, while darker areas absorb more heat.

As long as energy enters and leaves at the same rate, the climate system stays in balance and average temperatures remain relatively constant. If there is a change in the rate at which energy either enters or exits the system, the balance is upset: global temperatures will change and other elements of the climate system will adjust.

Climate Variability

Earth's climate is naturally variable, with warming and cooling trends being part of normal climatic cycles. It is a dynamic system that is continually changing as forces alter the delicate balances that exist among the main elements of the climate system. Temperatures vary within years, from year to year, and on larger time-scales over decades and centuries. For example, a major volcanic eruption increases the number of particles in the atmosphere and



Monitoring Solar Radiation

To better understand climate, we need to know how much energy is entering Earth's atmosphere and how much is leaving it. Although radiation measurements have been made for decades, we need to know more about the variability of this global energy budget from day-to-day and season-to-season, and the effects of this variability on climate.

Canada participates in an international radiation monitoring network called the Global Baseline Surface Radiation Network. Ground-based measurements are taken continuously using sophisticated equipment. These data are used along with satellite measurements to improve our understanding of Earth's energy budget. Canadian measurements are taken at Bratt's Lake in Saskatchewan (shown above), and at the new stratospheric observatory at Eureka, in the Canadian Arctic.

has a cooling effect for one or two years (as occurred following the 1991 eruption of Mt. Pinatubo in the Philippines). An El Niño (a warming of waters in the eastern Pacific Ocean near the equator) can disrupt weather patterns in many regions of the world for a year or so. Past changes in climate have been sufficient to cause major shifts in global ecosystems, with significant impacts on the natural environment and human development.

Because Earth's climate is naturally variable, it can be difficult to distinguish between natural phenomena and the results of human activities. Scientists are able to find answers by studying the underlying trends in the measured data. The fact that Earth is experiencing a warming trend has been established, but whether natural forces are contributing to this trend or working against it remains uncertain. In other words, a natural cooling trend would mask some of the effects of human-caused warming; a natural warming trend would compound the effects. Research is ongoing to develop a better understanding of the factors that are contributing to these identified trends.

The Greenhouse Effect

The "greenhouse effect" is a popular term used to describe how Earth's atmosphere keeps our planet at a comfortable temperature for plants, animals and people to live.

About half of the solar radiation from the sun passes through the atmosphere (the rest reflects off clouds, gets scattered by water vapour and particles, or is absorbed by the atmosphere). Some of the solar radiation that reaches Earth is reflected back into space, and some is absorbed by the oceans and land. The energy that is absorbed is converted into heat, warming the surface of Earth and the air around it. Some of that heat energy is radiated back out into space, but most of it is kept in by our atmosphere. Some of the gases in the atmosphere insulate Earth by preventing the heat from escaping. These "greenhouse gases" absorb heat and radiate it back to Earth's surface. Without this natural greenhouse effect, Earth would be much colder than it is now – about 33°C colder – making the average temperature on the planet –18°C and inhospitable to life.

Enhancing the Greenhouse Effect

The natural greenhouse effect works to regulate Earth's temperature, making it a unique planet for growing and living things. However, when the amounts of these gases change, the ability of the atmosphere to trap heat is also affected. Human activities have resulted in the release of significant quantities of greenhouse gases, which remain in the atmosphere for long periods of time. This intensifies the natural greenhouse effect. The most serious impact of modern human activities is the release of large quantities of carbon dioxide and methane into the atmosphere – primarily as a result of our dependence on fossil fuels. It is this "enhanced greenhouse effect" that is causing Earth to become warmer.

Human Activities and Climate Change

Since the end of the last ice age, the growing human population has literally changed the face of the world: building large urban areas,

converting wilderness to agricultural land, and contributing to the formation and spread of deserts. Changing the nature of the land surface affects its interactions with the other elements of the climate system. Humans also burn large amounts of biomass (wood and combustible agricultural products and by-products) and, more recently, fossil fuels (such as oil, natural gas and coal) for heat and energy, adding to the carbon dioxide in the atmosphere from natural sources.

The Industrial Revolution brought the extent of human influence on our environment to an entirely new level. The development of technologies using new forms of energy multiplied our productive capacity and greatly improved our standard of living. But it also increased both our dependence on the planet's resources and our impacts on the environment. Growth and technological development are continuing to transform both societies and landscapes at an unprecedented pace. Through the activities described below, we have also changed the composition and functioning of Earth's atmosphere. Without knowing it, humans have started a global experiment with Earth's climate system.

Since the 18th century, we have become increasingly dependent on **fossil fuels** such as coal, oil and natural gas to supply heat and energy, and move people and goods. Producing fossil fuels results in methane and carbon dioxide emissions, while burning them releases carbon dioxide and nitrous oxide into the atmosphere. When fossil fuels are burned, the carbon content is oxidized and released as carbon dioxide; every tonne of carbon burned produces 3.7 tonnes of carbon dioxide. The global consumption of fossil fuels is estimated to release 22 billion tonnes of carbon dioxide into the atmosphere every year – the key factor in human-induced climate change – and the amounts are still climbing.

THE GREENHOUSE GASES

There are five main greenhouse gases that occur naturally. The amounts of all five are to some degree affected by the activities of humans. Other gases include a family of chemicals created by humans.

Water vapour (H_2O) is the most common greenhouse gas. The amount of water vapour stored in the atmosphere increases as surface temperatures rise, because higher temperatures increase both evaporation and the capacity of air to hold water vapour. Thus, although humans do not directly influence the amount of water vapour in the atmosphere to a significant degree, rising temperatures will increase its concentration in the atmosphere.

Carbon dioxide (CO_2) is released into the atmosphere through decay, the natural processes of plant and animal life, and the burning of fuels and other materials. It is removed from the atmosphere by the photosynthesis of plants and absorption by the oceans. The increasing concentration of carbon dioxide in the atmosphere is believed to be the main contributor to the current warming trend.

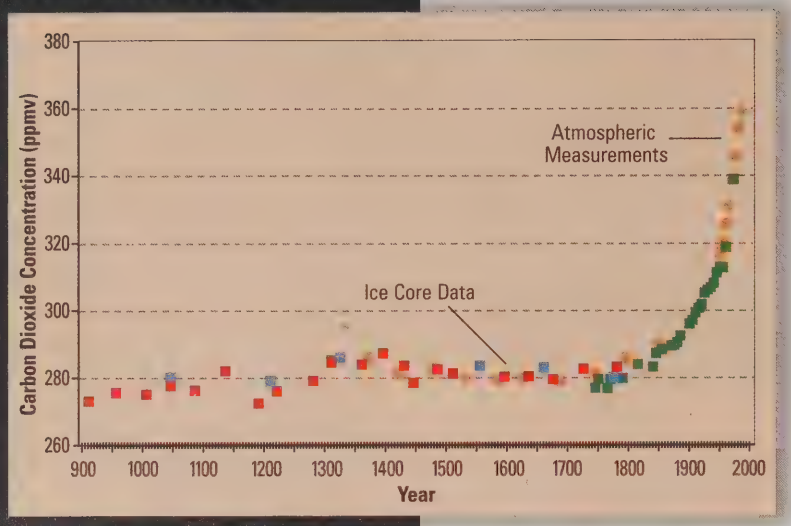
Methane (CH_4) is not as abundant as H_2O or CO_2, but is more effective at trapping heat, making it a very powerful greenhouse gas. It is created when matter decays in an oxygen-free environment. The main sources are wetlands, rice paddies, animal digestive processes, fossil fuel extraction and decaying garbage.

Nitrous oxide (N_2O) comes mostly from soils and the oceans. Some is released by burning fossil fuels and organic material. Soil cultivation and fertilizer use add to the amount of N_2O in the atmosphere. It is a powerful greenhouse gas, but is present in very low concentrations.

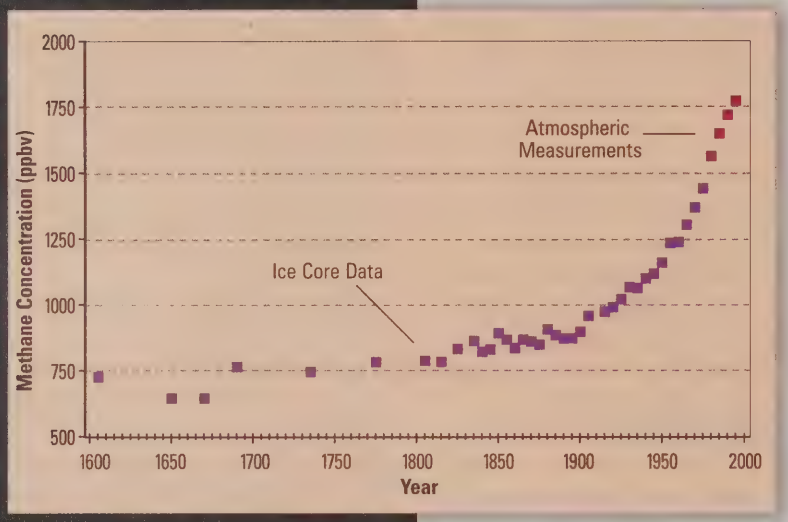
Ozone (O_3) exists naturally in the upper atmosphere where it also plays an important role in shielding Earth from the sun's harmful ultraviolet rays. Most of the ozone found in the lower atmosphere is the result of chemical reactions involving pollutants. Its role in climate change is significant, but complex and difficult to quantify.

Halocarbons are a group of human-made chemicals containing a halogen (bromine, chlorine or fluorine) and carbon. Many of these are extremely powerful greenhouse gases.

Trends in Carbon Dioxide Concentrations (Past 1000 Years)



Trends in Methane Concentrations (1600 AD to Present)



Since the beginning of the Industrial Revolution, concentrations of carbon dioxide have increased by 30 per cent, and methane by 145 per cent.

Trees and other vegetation act as natural storehouses for carbon dioxide; **deforestation** ultimately results in the release of the carbon dioxide into the atmosphere. More land has been cleared for human use in the last 100 years than in all of human history; the conversion of forests to agricultural land over this period is estimated to have released more than 100 billion tonnes of carbon dioxide into the atmosphere.

In addition to the effects of clearing the land, **agricultural practices** themselves have effects on the composition of the atmosphere. Rice production and raising domestic animals both result in increased emissions of methane. Modern tillage and fertilization techniques can lead to emissions of nitrous oxide. Old garbage disposal sites can also add to the atmospheric load of greenhouse gases by the release of methane.

A variety of industrial and commercial sources, including **refrigeration and air conditioning** systems, release halocarbons. Although their quantities in the atmosphere are not great, the heat-trapping capabilities of many halocarbons are extremely effective. As greenhouse gases, some chemicals in this group are over 10 000 times more powerful than carbon dioxide.

Humans also release large quantities of **aerosols** (very small particles and droplets) into the atmosphere by burning fossil fuels and biomass, and by producing dust while cultivating soils. Depending on their size and properties, these aerosols can both absorb and reflect sunlight. In most industrialized regions where emissions are quite high, these aerosols can cause a significant local cooling effect. Since these local disturbances also affect circulation patterns, the final effects can be global in scale.

The future growth of the human **population** is one of the most significant factors influencing our current predictions of Earth's warming trend (economic growth rates, energy efficiency and energy type are also very important). The global population has grown from about 600 million at the beginning of the 18th century to more than six billion today. Our numbers compound the stresses we place on our environment with our demands for energy, living space, agricultural land and raw resources. The number of humans on the planet places human activities on a scale that rivals the forces of nature in their influence on the environment.

Defining Climate Change

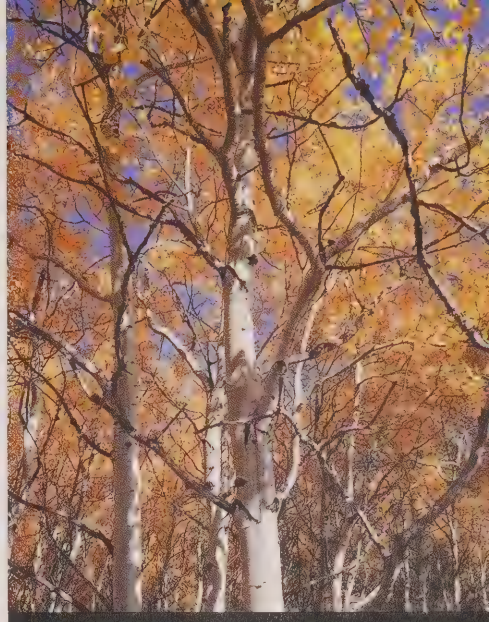
Global climate change is being driven by human emissions of greenhouse gases, and is most evident as a warming trend in global average temperature. Although this phenomenon is sometimes referred to as "global warming", climate change will include not only a change in average temperature, but also changes in many aspects of weather, such as wind patterns, the amount and type of precipitation, and the types and frequency of severe weather events that may be expected to occur in an area. The term "global climate change" more clearly describes the situation the world is facing.

Although both natural forces and human activities shape Earth's changing climate, the United Nations Framework Convention on Climate Change (UNFCCC) is primarily concerned with human-related activities. The UNFCCC defines climate change as "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods."[1]

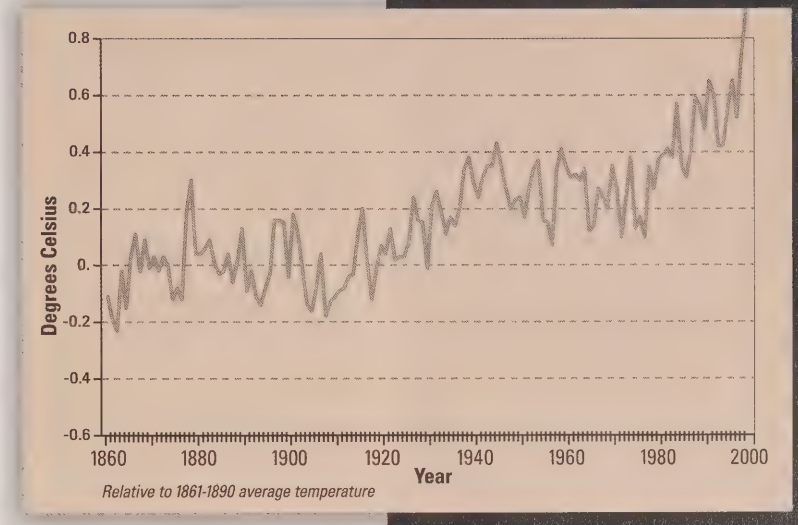
Climate Change So Far

Changes have already begun to occur in the global climate system. Earth's global average surface temperature in 1998 was the highest ever recorded since the mid-1800s, when consistent instrument records began to be kept worldwide. Over the past century, the world has warmed by more than half a degree, with 1998 representing the 20th consecutive year in which the global surface temperature was above normal. Seven of the 10 warmest years on record have occurred in the 1990s. All of the world's continents have displayed above-average temperatures in recent years. Long-term, continuous records are crucial for detecting and documenting climate change.

Climate change is a serious environmental issue today because both our natural and socio-economic systems are sensitive to changes in climate, and the projected rate and magnitude of change will result in significant impacts that may threaten the sustainability of these systems. Ecosystems, wildlife and humans are all better able to adapt to changes in climate that occur over long periods of time. The significant difference at this point in our history is the speed at which the changes are expected to occur. Human activities, not natural cycles, are behind the build-up of greenhouse gases, and the impacts wili be measured over decades, not centuries or millennia.



GLOBAL TEMPERATURE CHANGE 1860-1998



Source: National Oceanic and Atmospheric Administration (NOAA)

The motivation to act on climate change is not found in what we have seen to date, but in what our best scientific estimates anticipate will come in the near future. What we have experienced so far is still within the bounds of natural climate variation. However, if the warming trend continues at the rate currently projected, these bounds will soon be exceeded and the world will enter into a period of climate change unlike any in human history.

[1] UNFCCC, Article 1.2.

2 Looking to Science for Answers

In Canada and globally, policymakers and citizens look to scientists to help us understand our changing climate. We need to know what types of impacts we can expect in different areas, and what we can do in response.

Anticipating the Future

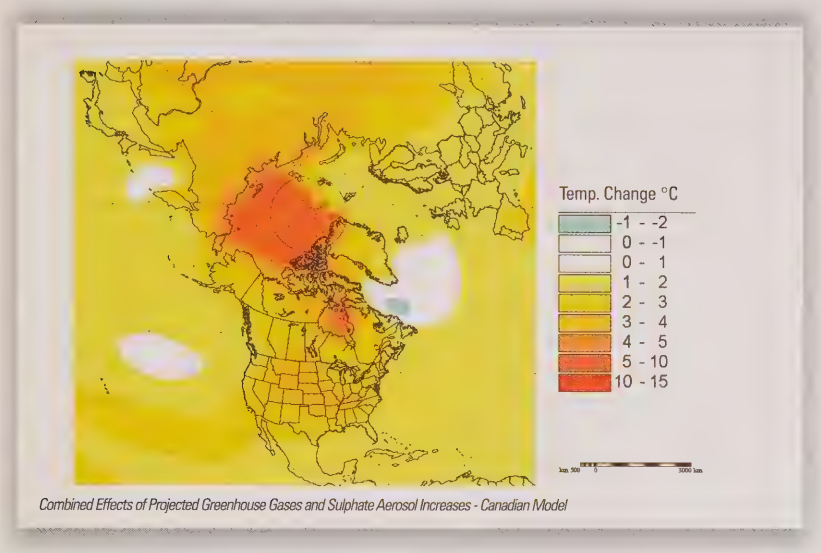
Powerful computer simulations called General Circulation Models, or GCMs, are the primary tools for estimating the future climate. The models are actually complex mathematical approximations of the physical and to some extent the biological and chemical processes that underlie the global climate system. The complex elements of the climate system – such as oceans, land masses, the atmosphere, ice and snow, and many other influencing factors – are mirrored by the GCM. The model allows scientists to manipulate elements of the system and run projections based upon various assumptions.

A major variable in developing climate projections involves estimating the future rates of greenhouse gas emissions from human activities. For example, new technology to reduce emissions from vehicles could lead to a major decrease in transportation-related emissions. The development of renewable or non-carbon-based energy options is also important, especially over the long term. Government policies regarding land use – such as protecting sensitive areas, managing urban development, regulating agricultural practices, and reforestation – could also have an impact, as could energy-efficiency programs. Future rates of population and economic growth are crucial factors that will influence emission levels, as are our patterns of energy use, including energy type and energy efficiency.

The warming trend

The best current scientific estimates suggest that over the next century, Earth's climate will be shaped more by the increasing concentrations of greenhouse gases than by any other factor. Since the 18th century, enough greenhouse gases have been added to the atmosphere to increase temperatures significantly. However, Earth's climate system, with its deep oceans and cold polar regions, can take some time to respond to changes in greenhouse gas concentration. Over the last 100 years global average annual temperatures have increased by about 0.5°C, which corresponds to the

Projected Temperature Change Between 1975-1995 and 2040-2060



Combined Effects of Projected Greenhouse Gases and Sulphate Aerosol Increases - Canadian Model

Source: Atmospheric Environment Service

findings of most sophisticated climate models currently available.

While there are uncertainties about the timing and rate of future changes, estimates provided in the 1995 report of the Intergovernmental Panel on Climate Change (IPCC) suggest that average global temperatures are likely to increase by 1 to 3.5°C over the next century (depending primarily on the rate of greenhouse gas emissions from human activities). The accepted mid-range estimate predicts an increase of 2°C. Estimates based on more recent models suggest that this range may be higher.

Although climate change has global consequences, not all regions of the world will be affected equally. There are differences in the projected magnitude of changes in climate, as well as differences in sensitivity and adaptive capacity. Scientists are projecting that warming will be greater in polar regions than nearer to the equator. This has serious implications for sensitive polar ecosystems, their wildlife and human inhabitants. Scientists are also projecting that continental interiors will experience greater warming than coastal areas. Continental interior regions may face more frequent and intense heat waves as a result.

For Canada, different regions and sectors will experience varying levels of impacts, with some expected to have a greater share of negative consequences. The uneven distribution of climate change could result in increases in average annual temperatures that will be greatest in the Arctic region. The central area of the country, including the Prairie provinces, Ontario and Quebec, will be most likely to experience more frequent and intense severe heat conditions.

The Canadian Centre for Climate Modelling and Analysis

Researchers at the Canadian Centre for Climate Modelling and Analysis (CCCma) have developed some of the most advanced GCMs in use today. The CCCma has developed a number of climate simulation models to help predict the climate, study climate change and variability, and better understand the various processes which govern our climate system. The CCCma also participates in several Canadian Climate Research Network model development projects, as well as a broad range of international studies and programs. The Centre recently completed a climate change experiment in which the effects of an increase in greenhouse gas and aerosol concentrations from 1850 to 2100 were modelled. Selected data from CCCma simulations are contributed to the IPCC Data Distribution Centre to facilitate their use for climate impact studies. As sophisticated as the CCCma models are, they still cannot fully integrate all the parts of the complex climate system. Work to further refine the models is ongoing.

Being Prepared: Climate Change and Storm Surges

Meteorologists at the Canadian Hurricane Centre in Halifax, Nova Scotia, are on the leading edge of studies about the danger that storm-induced waves and tides – known as "storm surges" – pose to coastal communities. They are using complex computer models and historic records to diagnose these storms and better understand the physics that drive them. With sea levels rising and storms becoming more intense due to climate change, scientists estimate that the potential exists for a severe storm surge to cause widespread and intense flooding in heavily populated coastal areas and on low-lying farmland.

Being prepared for these extreme events is essential to minimizing damages. Meteorologists are helping to ensure public safety by issuing technical and public bulletins, and assisting emergency responders in contingency planning. By encouraging land-use planners to consider this information when developing flood plans, managing dikes and building coastal infrastructure, science is helping Canadians to prepare for these dangerous storms.

Rising sea level

Low-lying and coastal areas face risks associated with a rise in sea levels. Higher temperatures will cause oceans to expand (water expands as it warms) and will melt glaciers and ice cover over land – ultimately increasing the volume of water in the world's oceans and causing sea levels to rise. Mid-range estimates indicate that sea levels will rise by an average of 5 cm per decade, totalling 50 cm over the next 100 years. The high estimate suggests that sea levels could rise by almost a full metre by 2100. For Canada's coastal areas, there are concerns about increased flooding, coastal erosion and sediment distribution, particularly on the Atlantic coast.

Climate change and extreme weather

Over the past several years Canada has experienced a number of weather-related disasters, including the major floods in Quebec's Saguenay region in 1996, the flooding of Manitoba's Red River in 1997, and the ice storm that crippled eastern Ontario and much of Quebec in 1998. While difficult to predict, the frequency and severity of extreme events could increase dramatically as a result of climate change. Scientific observations to date suggest that large changes in the frequency of extreme events can be associated with even small changes in average temperature.

It is possible that severe storm patterns will shift as the planet warms. Combined with the rise in sea level, this may result in an increased number of severe weather events for Canada's Atlantic coast, where flooding of low-lying neighbourhoods, docks and port facilities is a concern. Research suggests that conditions favourable to some extreme weather events such as tornadoes and severe heat waves may become more prevalent.

Warmer winters may increase the potential for more intense winter storms. In summer, we may see increased intense precipitation events resulting in localized flooding. The patterns of other weather-related conditions, such as droughts, may also change in some parts of Canada.

The Role of Science in Guiding Policy Development

Mounting scientific evidence indicates that human activities are affecting Earth's climate. This evidence has helped put the issue of climate change onto the international agenda. Science is also playing a major role in guiding international efforts to reduce greenhouse gas emissions and adapt to the changing climate. In 1988, the United Nations Environment Program and the World Meteorological Organization created the Intergovernmental Panel on Climate Change. The IPCC's role is three-fold: assessing the available scientific information, assessing the potential impacts, and formulating strategies to respond to climate change.

Canada has contributed to the work of the IPCC. Our scientists have been lead authors, contributors and reviewers for both the First and Second Assessment Reports, produced in 1990 and 1995. Many other Canadian scientists have participated in the published research that is reviewed as part of the assessment process. These reports represent the views of scientists from countries around the world, and are the most authoritative statements on climate change so far produced.

Scientists taking ice core samples in the Arctic.

The IPCC is working on a Third Assessment Report, scheduled for completion in 2001. Over 30 Canadian scientists are participating as authors and editors. Like the earlier reports, it will present a comprehensive and up-to-date assessment of climate change, focusing on new findings since 1995. It will look at regional impacts of climate change, and pay special attention to issues regarding the world's ability to adapt to climate change. Canadian scientists have been instrumental in putting the issue of adaptation to climate change on the science agenda in recent years.

Canada recognizes the essential role of science in helping us respond effectively to climate change over the long term. Ongoing research and monitoring activities inform policy- and decision-makers of the potential impacts of climate change. They need to know where, when and to what degree these impacts will be felt – globally, nationally and regionally – in order to develop both Canada's international negotiating positions and domestic responses to climate change.

Current Science Initiatives

Canada has done a great deal to bring scientists from all research sectors together to focus on climate change. Within the Government of Canada, the four natural resources departments (Environment, Natural Resources, Agriculture and Agri-Food, and Fisheries and Oceans) and Health Canada all employ scientists in climate change work. Recognizing that comprehensive, multidisciplinary scientific knowledge is the basis for sound policymaking on climate change, these departments have significantly increased their collaboration on climate change issues. There has also been a concerted effort to engage the energies, ideas and talents of Canada's university and private-sector communities.

Canadian scientists are involved in a number of different types of projects related to climate change. Activities within climate science include studying climate processes; developing and running climate models to project future climate patterns, with special emphasis on Canada; and observing and tracking climate trends and variations in Canada, including the emissions of greenhouse gases. Canadian scientists participate in scientific assessment work both in Canada, such as the Canada Country Study described in the next chapter, and internationally, primarily through the IPCC and a number of other international programs. In Canada, two areas of scientific investigation that have expanded in recent years are the study of greenhouse gas cycles, and impacts and adaptations research.

Climate science

The Canadian Climate Program Board oversees research activities and facilitates cooperation in Canada in the area of climate and climate change. The Program Board is also responsible for the preparation of the science, impacts and adaptation components of Canada's National Implementation

Extreme costs

Research suggests that Canada is particularly vulnerable to extreme weather events, which can cause significant economic losses. Changes in extremes are potentially more costly than changes in Canada's average climate. For example, in January 1998, portions of Ontario and Quebec experienced a severe ice storm, with freezing rain twice the thickness of that in Canada's previous worst storms. Insurance payments associated with this event surpassed $2 billion.

Strategy on Climate Change. The Government of Canada sponsors an innovative research program called the Climate Research Network in 16 universities across Canada. The program aims to increase understanding of chemical, physical and biological processes related to climate change.

Canada continuously monitors the physical and chemical properties of the atmosphere. Climate observations are taken at hundreds of locations across the country, and greenhouse gas concentrations are measured at three sites, one in the Arctic and one on each coast. Periodic measurements of carbon dioxide in Pacific surface waters are also being conducted, in collaboration with international partners. Canadian researchers participate in several major climate-related field programs, including the Boreal Ecosystem Research and Monitoring Study, a collaborative project looking at greenhouse gas fluctuations and carbon sequestration in the central Canadian boreal forest.

Our research programs include the study of greenhouse gases so that we can better understand their natural cycles and how human activities are affecting these cycles. In addition, we can better quantify the amounts of greenhouse gases stored in our oceans, forests, soils and wetlands (or terrestrial ecosystems). This research is critical to our ability to include human measures that increase the storage of carbon in our forests and agricultural soils as part of our international commitments. Scientists work both as part of larger international programs and on areas of specific concern to Canada such as the boreal forest and northern wetlands.

The Canadian Climate Research Network

The Canadian Climate Research Network, established in 1994, consists of a network of nine collaborative research groups, each focusing on a particular element of climate research and involving scientists from universities, government and the private sector.

The *Climate Variability* group seeks to advance our understanding of natural climate variability.

The *Land-Surface Processes* group is developing improved models of key hydrological and soil processes to support better predictions of important factors such as soil moisture.

The *Carbon Cycle* group is working to improve our understanding of the sources and sinks (storehouses) of carbon dioxide, crucial for the prediction of future greenhouse gas levels and the development of control strategies.

The *Regional Climate Modelling* group is developing a tool which will give more precise answers to the issue of regional distribution of climate change in Canada. The information it provides is important for climate impact studies.

Five groups focus on other specific aspects of climate modelling: Middle Atmosphere Models, Regional Ocean Circulation Models, Global Ocean Circulation Models, Paleoclimate Models, and Aerosols and Climate.

Canadian participation in international programs

Because climate change is a global problem, countries need to work together to find a solution. Canadian participation in international scientific programs also helps to focus attention on issues of concern to Canada, and attracts the interest of other leading international scientists and external funding sources to scientific work being conducted in Canada. When Canada contributes data to the global system, we in turn benefit from observations collected elsewhere around the globe.

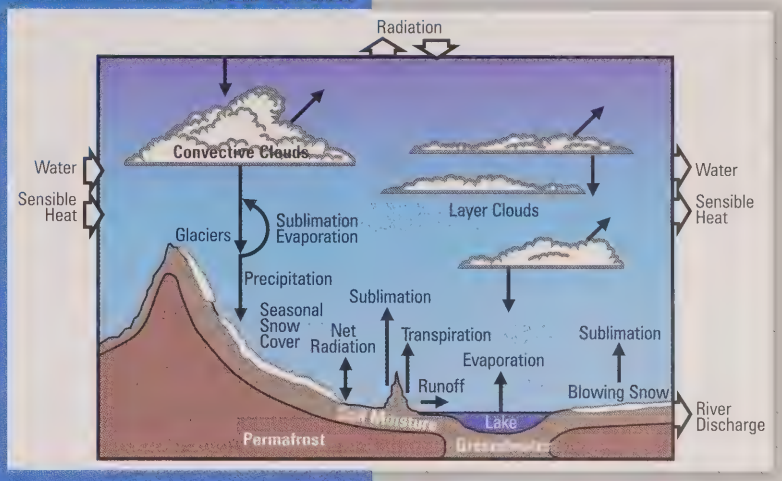
In addition to participating in the IPCC, Canada is involved in a number of international research and monitoring initiatives to deepen scientific understanding of the global climate system, and the potential impacts of human interference with its processes. Chief among these is the World Climate Research Programme, which furthers scientific understanding of the climate system and climate processes. Within this Programme, for example, Canadian scientists are working on the World Ocean Circulation Experiment and the Joint Global Ocean Flux Study to help improve understanding of ocean processes and contribute to the development of ocean components of climate models. Our participation in the Global Energy and Water Experiment involves studying hydrological processes in the permafrost-saturated and largely snow-covered lands of the Mackenzie River Basin.

A key related program is the Global Climate Observing System, which combines observations of the atmosphere, the oceans, and terrestrial systems into an integrated set of observations of the global climate system. This system was established to meet the data needs for climate system monitoring, for assessing impacts of climate variability and change, and for applications to national economic development.

The Mackenzie GEWEX Study

The Global Energy and Water Experiment (GEWEX) is a major component of the World Climate Research Program. As part of GEWEX, Canadian scientists are conducting the Mackenzie GEWEX Study (MAGS), a research program designed to study the energy and water cycles in a major northward-flowing river system. Results from MAGS are leading to improvements in Canadian climate models, a better knowledge of water resources in the North, and insights into early manifestations of climate change in a particularly sensitive region.

Water and Energy Flows of the Mackenzie Basin



The Georgia Basin Futures Project

The Georgia Basin Futures Project, led by the Sustainable Development Research Institute at the University of British Columbia, examines how sustainability can be achieved regionally by reconciling environmental, economic and social goals. An important component of this five-year study is the development of a model of the Georgia Basin region known as Georgia Basin QUEST. This model will enable people to make choices regarding various long-term planning options for the region, then provide a picture of the future consequences of these choices for regional land use, transportation, air quality and economic growth. The model is intended to become part of the regional stakeholder consultation process and to spark discussion on preferences for sustainable futures.

The Adaptation and Impacts Research Group at Environment Canada is incorporating climate change impacts into some of the model's components. This research is in its very early stages, but it is anticipated that the model will let people choose climate change scenarios and see their impacts on regional water resources, agriculture, forestry, fisheries and air quality. This will become part of the broader dialogue on regional futures, putting global climate change impacts in the context of long-term regional development.

Impacts and adaptations research initiatives

Among the research activities currently under way in Canada are assessments of both the potential impacts of climate change and the ability of Canadian communities to adapt. A number of these research projects are collaborative and integrative in nature, involving the participation of stakeholders. Some of the recent work is highlighted in the following section, "Canada and Climate Change." One of the more comprehensive ongoing studies is the Georgia Basin Futures Project.

The Government of Canada's Climate Change Action Fund (CCAF), which targets research in climate science, impacts and adaptation, is also funding various research projects. More information on the Fund can be found in *Canada's Perspective on Climate Change: Taking on the Challenge.*

3 Canada and Climate Change

Canada's climate is an important part of our history, culture and national identity. As a northern nation Canada is expected to experience a greater degree of warming than countries closer to the equator. Canada's average annual temperature has been increasing over the past century, and it may be more than 4°C warmer by the end of the 21st century (compared to the projected global average increase of about 2°C). To put this change into perspective, consider that average global temperatures during the last ice age were only about 4 to 6°C lower than they are today.

Canada represents about 1.8% of the world's greenhouse gas emissions from human activities.[2] Although this is not a large proportion of global total, Canadian emissions per capita[3] rank second in the world. This can largely be attributed to the facts that Canada has a cold climate, its population is sparsely distributed over a large geographic area and is growing at the highest rate among G-8 countries, and it has a developed, energy-intensive, resource-based economy.

Climate change is a challenge for Canadians. Our emissions are high, yet Canada is also at risk from the potential impacts of climate change. A change in our climate may have far-reaching consequences for the lives of many Canadians.

Impacts and Adaptation

The Canada Country Study, completed in the fall of 1998, was a nationwide assessment of how much we know about the potential impacts of climate change on Canada, and how we could respond and adapt to these impacts. More than 50 experts from across Canada surveyed and synthesized the existing research on the social, biological and economic impacts of climate change – across Canada's diverse regions, ecosystems and economic sectors – and the ways that Canada might respond to these challenges. The results of the study give us the best picture so far of what climate change might mean for Canada and Canadians.

Adaptation involves taking action to minimize the negative impacts of climate change – and taking advantage of new opportunities that may arise. Taking steps to adapt to climate change is not seen as an alternative to reducing greenhouse gas emissions or other actions to mitigate climate change. It is also recognized that in some cases adaptation is not likely to be a viable option. However, we must start planning our adaptive responses now; by doing so, we may help to lessen some of the environmental, economic and human costs of climate change.

[2] Data for the 1990 baseline year.
[3] 22.1 tonnes measured as carbon dioxide equivalent in 1990.

New science directions

The Canada Country Study also identified areas where there were gaps in the available scientific information and made recommendations for further research. There is a need to conduct new research on the impacts of climate change on some of Canada's geographic areas and economic activities, and to study the impacts on water resources, and urban areas and infrastructure in more detail. The Impacts and Adaptation component of Canada's Climate Change Action Fund is funding research to help fill in some of these gaps.

Climate change and human health

Climate change could have potentially serious effects on human health. The most direct risk is increased heat stress. Increasing frequency and severity of heat waves may lead to an increase in illness and death, especially among the very young, the elderly and the ill. Heat conditions are likely to be most severe in large urban areas. On the other hand, less cold stress in winter (currently the number one weather-related killer in Canada) would reduce loss of life due to exposure to extreme cold conditions and other winter hazards.

There are also a number of indirect human health impacts, including worsening of respiratory disorders and allergy problems as a result of increased heat and humidity and declining air quality in some areas. Some infectious diseases may also extend their range northward into Canada, making it necessary to increase control measures.

Canada's water resources

Canada's water resources are essential to our society and economy, and a critical factor in natural ecosystems. Fairly small changes in temperature and precipitation patterns can result in significant changes in the amount and timing of spring runoff, the intensity of floods and droughts, and the rate of evaporation from soils and surface waters.

Climate change is expected to have a major impact on regional water resources. In some areas, particularly in the populated southern regions, less water is projected to be available for hydroelectric power generation, transportation, agricultural uses, fisheries and recreation. In other regions, resources may actually increase. Of particular concern to Canadians is the availability and safety of municipal water supplies. One serious impact

Toronto-Niagara Region Study

An assessment of the impacts of climate change in Canada would be incomplete without understanding the sensitivity and adaptability of its cities and surrounding countrysides. Almost 20 per cent of Canada's population lives in the Toronto-Niagara Region (TNR). This region is the focus of a study examining the implications of climate variability, climate change and other sources of atmospheric stress (like ground-level ozone) for key urban concerns including human health, infrastructure and the natural environment.

Working with regional stakeholders and building upon existing research programs, the TNR Study on Atmospheric Change will identify and evaluate the challenges and opportunities associated with managing climate change and other air issues in an increasingly urban society.

of climate change may be drought, resulting in declining surface water levels and flows and diminished groundwater supplies (25 per cent of Canadians rely on groundwater sources). There are likely to be challenges associated with managing competing demands for a more limited resource.

Reduced supplies are also likely to have water quality impacts, which may increase the level of water treatment required. Health disorders related to environmental contamination by bacteria, viruses and parasites may also become more of a concern. For coastal communities, storms and rising sea levels would threaten water supplies with saltwater contamination.

Impacts on farming and fishing

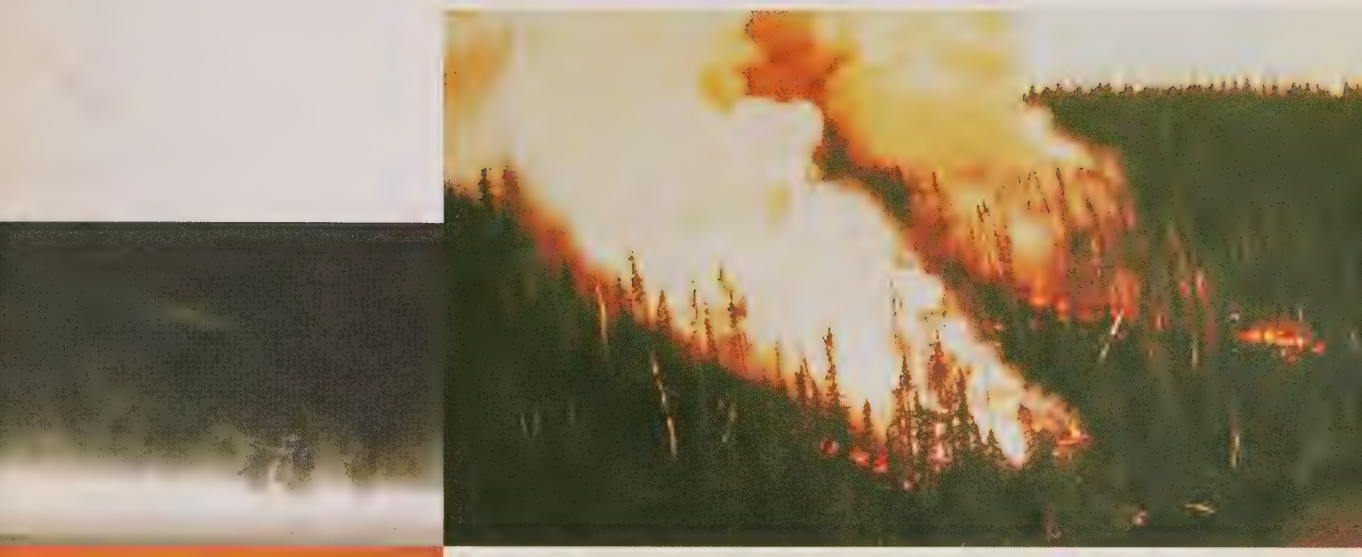
Impacts on Canada's agriculture will be seen in the response of crops, livestock, soils, weeds, insects and diseases to warmer conditions. An estimated three- to five-week extension of the frost-free season would considerably benefit commercial agriculture in Ontario, Quebec and the Prairies – however, it is also expected that dry soil conditions will intensify and may result in net reduced yields in many regions. Reliance on irrigation may increase where water resources are available, heightening the demands on water resources and the potential for conflict.

Canada's fisheries are an important source of food production and also play a role in tourism and recreation. As many species are sensitive to changes in water temperature, climate change may affect populations and ranges.

Adapting Canadian agriculture

There are a number of possible adaptation strategies that may be considered by individual Canadian farmers, or be considered as program elements by agricultural policy-makers. Adaptations will be primarily aimed at reducing the impact of predicted drier soil conditions and drought, and taking advantage of the longer growing season.

One strategy involves changing the land itself. Subdividing fields, levelling and terracing are options that can reduce runoff. Introducing irrigation systems or improving existing ones may be a possibility where water resources



are adequate. Choosing alternative crops can conserve soil moisture and nutrients, reduce runoff and control erosion. In some areas it may be advantageous to change the timing of tillage and planting operations to account for changes in rainfall patterns. Agricultural science will also have a role to play in developing improved varieties that are better suited to changing conditions.

Canada's inland fisheries

Although there are small commercial fisheries in Canada's inland waters, most inland fishing is recreational. The inland fisheries also provide a local food source for communities. Recreational fisheries are an important element of many local economies, and the economic well-being of these communities would be affected by negative impacts on their fisheries. The projected decline in water levels in lakes, reduced flow rates in streams, and changes in water temperature and nutrient distribution may all contribute to a decrease in the sustainable harvest.

Canada's forests

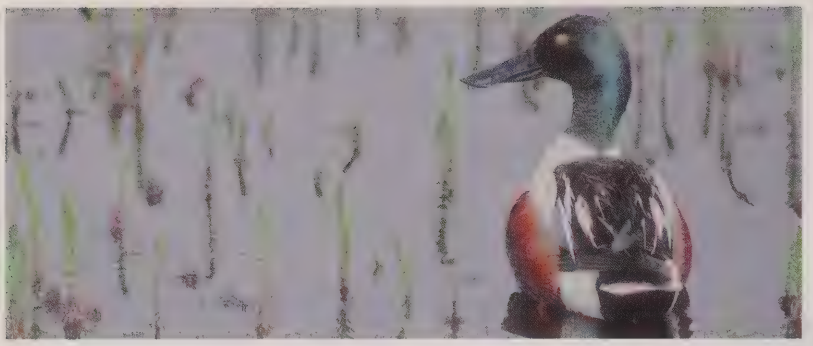
Canada's forests cover 42 per cent of our total land area and store significant quantities of carbon. One possible way to counter greenhouse gas emissions is to store more carbon in our forests through reforestation of cleared land. Canadian scientists are conducting research to provide better estimates of the storage of carbon in our forests, how that may change as the climate changes, and how human actions might increase the amount of carbon stored.

Forests are also a source of employment for Canadians, and provide habitat for an estimated 200 000 species of wildlife. Canada's climate is projected to change faster than the forests will be able to adapt or migrate; it may take decades or centuries for the forests to adjust. As forests respond very slowly to change, large parts of the forested regions will become mismatched with a rapidly changing climate and will become stressed.

It is possible that the forest belt may eventually shift northward by up to 500 kilometres, but the composition of the forest will be affected by competition from fast-growing species and the poorer soil conditions to the north. In addition to the direct effects of temperature change, some forested areas may experience more droughts and fires, and the migration of insects and disease into new territories. The boreal forest in particular will be more vulnerable to these threats during the period of adjustment.

Climate change and forest fires

Increasingly hot and dry summers are predicted to increase the risk of forest fire. Researchers at the Canadian Forest Service are studying forest fires and climate in order to better predict the future vulnerability of our forests. Their work will lead to a better understanding of forest conditions in a changing climate and how we can best adapt to deal with these circumstances.



Ecosystems and wildlife

Earth's ecosystems are our reservoir of genetic diversity. The plants and animals in the natural environment depend on climate to a considerable degree. Climate shapes the lifecycles of plants and animals and the limits of their range. Small temperature variations can have major effects on natural ecosystems. The make-up and location of many ecosystems will shift as individual species respond to changing climate, leaving some ecosystems unstable for centuries.

Wetlands cover 14 per cent of Canada's land mass, providing habitat for many species, including some that are rare, threatened or endangered. Wetlands play important roles in storing atmospheric carbon, cycling minerals and nutrients, purifying water, controlling floods, and supplying the baseflow for rivers and streams. Sea-level rise and the threat of saltwater flooding from storm surges may have detrimental effects on some of Canada's coastal wetland areas. Projected lower water levels in inland wetlands would lead to a decline in both the area and quality of waterfowl habitat.

Conservation in motion

Climate change is expected to cause the range of many Canadian ecosystems to shift. Since many species are anticipated to have difficulty adapting to rapidly changing conditions, the emphasis for wildlife protection must be on human activities to help protect their habitat. These activities may include building physical structures to protect sensitive coastal wetlands, and reserving additional lands inland or to the north of existing nature reserves. Care must be taken to ensure that the areas set aside for habitat are large enough and in suitable locations. In some cases, "migration corridors" connecting protected areas can be created for plant and animal species.

Our built environment

"Built environment" describes the part of our environment that has been built by humans, including homes, buildings, roads, railways and other structures. Climate change could lead to problems for the existing built environment (as a result of flooding, increased ice loads, and land instability, among other risks) and changes in the way we build in the future.

In contrast to extreme events, where the damage is done in seconds, minutes or days, premature failure caused by deterioration from the weather elements may take months or years to become evident. Rates of erosion by the slower day-to-day processes of wind and water, freeze-thaw cycles and other factors may also be affected by climate change.

If damages to the built environment increase, Canada's insurance industry could face higher and more numerous claim payments. This situation could lead to steep premium increases or coverage restrictions for property insurance.

Developing new standards

The premature deterioration of clay bricks is an emerging problem in need of a solution. The brick industry is investigating the causes of weathering so that approaches can be developed to prevent deterioration. The results of this study may become the basis for a new standard that will apply to all of North America.

A similar problem exists with accelerated deterioration of reinforced concrete materials. Existing standards do not adequately protect concrete in some parts of the country, including the Toronto-Niagara Region. Preventive actions must be developed today so that infrastructure does not become more vulnerable in the near future.

Building for the Future

New construction has already begun to take the impacts of climate change into consideration. For example, the Confederation Bridge between New Brunswick and Prince Edward Island was built to accommodate potential sea-level rise during its 100-year life span.

Source: Public Works and Government Services Canada

Some northern species may benefit from climate change – others will be threatened. For example, the range and numbers of beluga and bowhead whales might increase, and sea otters could move into new territories. But sea lions and walruses need ice cover for breeding and feeding, and their numbers may decline.

The potential consequences for polar bears are especially worrisome. Longer ice-free periods would make it difficult for the Hudson Bay population of bears to hunt, and they may become unable to store enough fat to survive. Should the Arctic Ocean become seasonally ice-free for a long period, the Hudson Bay bears may be threatened.

Canada's North

As the world warms, temperature changes are anticipated to be greater in the North, and greater in winter than in summer. Winters in the Canadian Arctic are projected to average 5 to 8°C warmer by 2100. Projected changes in northern permafrost will be a serious concern for Canada's northern communities. Infrastructure such as roadways, utilities, pipelines and railroads may also be vulnerable. Warmer temperatures may lead to increased frost heave and thaw settlement, creating unstable ground conditions. Changing foundation conditions could threaten the structural integrity of buildings, or even lead to their collapse.

Buildings and permafrost thaw

Scientists at the Geological Survey of Canada are working with local governments and industry in the North to assess the potential sensitivity of buildings in the town of Norman Wells to permafrost thaw due to future climate change. With this information, municipal planners will be able to better plan changes to their infrastructure replacement and building guidelines to adapt to climate change.

The Costs of Adaptation

Canada could experience a level of warming in the decades ahead that could result in a high level of stress for our water resources, fisheries, forests and agricultural lands. In addition, climate variability and extremes associated with climate change are also projected to produce negative consequences for Canadians. Adjusting to new weather patterns will be hard and, in some cases, very costly.

Other resource-based areas of our economy, such as the energy industry, and our tourism and recreation industries, may also face serious new challenges. Aspects of our current urban infrastructure, transportation and utility corridors, public health system and emergency response capabilities may require expansion and upgrading to cope with the effects of changing weather patterns.

The global economy will also be sensitive to many of the impacts of the shifting climate. Since Canada's economy is vulnerable to downturns in global markets, it is also in our interest to prepare for global economic events that may affect our well-being.

These impacts may also affect the way many Canadians make their living. Failing to plan for and adapt to climate change could result in negative economic consequences, including business failures and job loss, within affected sectors of the economy.

Although the potential benefits of climate change do not balance the costs, they must also be recognized. Similarly, failing to take advantage of potential opportunities will serve only to compound the social and economic costs of climate change.

Across all major economic sectors there is a need to conduct impact assessments, examine the risks and opportunities, and develop awareness of these issues for business planning and policy development.

Source: Geological Survey of Canada. Railway tracks are warped due to the thawing and freezing of permafrost.

4 Responding to Climate Change

There is a scientific consensus that continuing human emissions of greenhouse gases pose a very serious threat to the global environment...

Canada and the World: Global and National Efforts

While the human role in climate change has been discussed and debated in scientific circles for some time, it is only recently that it has been recognized as a critical global environmental issue. The 1988 Toronto Conference on the Changing Atmosphere was a turning point that first put climate change on the international and Canadian environmental agendas. Shortly afterward, the IPCC was set up and began working on its first assessment report, which was released in 1990.

The report contributed greatly to the deliberations that led to the establishment of the United Nations Framework Convention on Climate Change (UNFCCC). This agreement was signed by 154 countries, including Canada, at the Earth Summit in Rio de Janeiro in June 1992. Under the UNFCCC, Canada and other nations have agreed to measures relating to the monitoring and reporting of national emissions of greenhouse gases, to undertake actions to reduce these emissions, and to undertake scientific initiatives to build the global community's knowledge of climate processes, impacts and adaptations.

In December 1997, at the Third Conference of the Parties to the UNFCCC, some 160 nations negotiated an international climate change agreement – the Kyoto Protocol. The Protocol sets out emission reduction targets that will be binding on parties when the agreement is ratified. Canada's Kyoto target is to bring our greenhouse gas emissions down to six per cent below 1990 levels by the period between 2008 and 2012.

The contributions of Canadian and international science are essential to understanding the issues associated with climate change and developing appropriate responses. Canada's science-related activities build on

the commitments made by all developed countries under the UNFCCC and on the terms of the Kyoto Protocol. Commitments include promoting and cooperating in scientific research and observation, supporting and strengthening research programs, and developing programs containing appropriate mitigation and adaptation measures.

Responding on Three Fronts: Mitigation, Adaptation and Reducing Uncertainty

Canada's federal, provincial and territorial ministers of energy and environment meet regularly to discuss issues of concern. They have determined that Canada's response strategy will focus on three areas: mitigation, adaptation and reducing uncertainty through improved climate science. Mitigation – acting to slow the warming trend by reducing

greenhouse gas emissions and other measures – remains an essential response. Slowing climate change will provide the world with more time to better understand and prepare for the anticipated consequences. We must also look at adaptation strategies to help soften the impacts of increasing temperatures and the associated impacts related to changes in sea level and precipitation patterns. Improving our understanding of all aspects of climate change is essential to forming sound international and domestic policy, and taking effective actions to mitigate and adapt to climate change.

Canadian science has a role to play in supporting both mitigative and adaptive responses. To date, most of Canada's domestic actions on climate change have focused on mitigation. Adaptation activities are assuming a growing role in Canada's response to climate change.

The types of adaptation measures adopted will depend on the impact of climate change on particular regions and economic sectors. Increasing our capacity to adapt reduces our vulnerability to the effects of climate change. Successful adaptation depends on a number of factors, including the best available climate predictions, access to information and appropriate technology. The availability of financing to support adaptation measures will be an important issue.

Canadian scientists will contribute to the development of adaptive responses by providing the best possible information on the anticipated impacts of climate change nationally and regionally. They will also assist with the development, evaluation and implementation of adaptation strategies.

Canada will soon have a new plan of action to address the challenges of climate change. Representatives from Canada's federal, provincial, territorial and municipal governments along with scientists, academics, and stakeholders from industry, environmental groups and other organizations are creating a new National Implementation Strategy on Climate Change. Their work will include analyzing recent emissions data and climate projections, and making recommendations to reduce Canada's greenhouse gas emissions to meet the targets in the Kyoto Protocol. There will also be emphasis on planning to adapt to climate change and strengthening our science capacity.

Taking Action Now

The role of atmospheric greenhouse gases in regulating Earth's climate is well documented, and the fact that humans are emitting very significant quantities of these gases is beyond dispute. There is a scientific consensus that continuing human emissions of greenhouse gases pose a very serious threat to the global environment; the lack of full scientific certainty should not be used as a reason to postpone taking action. Measures to reduce emissions are not premature and may in fact be long overdue.

Reducing human emissions of greenhouse gases will have an impact on the warming trend, but will be unlikely to stop or reverse it in the foreseeable future. However, slowing the rate of change remains essential to providing us with more time to adapt to our changing environment and adopt new mitigation strategies.

Canada's Perspective on Climate Change: Taking on the Challenge describes Canada's programs to take action on climate change. On the individual level, Canadians are being encouraged – through governmental communications, workplace and community initiatives, and the campaigns of non-governmental organizations – to become informed about climate change, and support efforts to slow its progress. On a practical level, the most important step individual Canadians can take to slow climate change is to practice energy efficiency in our everyday lives. Efforts continue to help Canadians become more energy efficient in our homes, our transportation habits and in the workplace.

Many of the actions being encouraged initially are "no-regrets" measures – measures with added benefits, such as reduced energy costs and better air quality, that equal or exceed their cost to society before taking into account the benefits of climate change mitigation. They are sometimes known as "measures worth doing anyway."

Canadians are also taking the first steps toward adapting to climate change. Increasingly, governments and industry are beginning to take the potential impacts of climate change into account when developing strategies for the future. While not currently a high-profile public concern, adaptation issues are likely to become more pressing in Canadian communities experiencing the impacts of climate change.

Conclusion

Climate change is a global phenomenon that requires a concerted global response. Scientists agree that while the current warming trend cannot be easily stopped or reversed, it must be slowed to enable ecosystems and human societies to adapt.

Sound scientific knowledge must be the basis for discussion on climate change at all levels. Canadian scientists and science programs play a critical ongoing role in informing policy- and decision-makers of the potential impacts of climate change across the country. This work includes supporting the development of Canada's positions in international negotiations and helping to identify and develop options for both domestic mitigative measures and adaptation strategies. Canadian scientists and science programs also support public education and outreach efforts with information on the potential risks of climate change – helping individuals and communities to participate in the solutions to Canada's climate change challenges.

Continued research will help us better understand the human- and naturally induced changes in our environment, and better assess the likely impacts of climate change and the actions required to address them. As our knowledge increases and the cumulative effects of greenhouse gas emissions become better known, science will continue to guide the evolution of emission reduction targets and strategies for adapting to climate changes in the 21st century.

For More Information

The Canadian Web sites listed below offer information on Canadian climate change programs and initiatives. Most of them also provide links to other climate change sites. For more information and a copy of a climate change kit with ideas on how you can reduce greenhouse gas emissions, please call the toll-free line 1 800 O-Canada (1 800 622-6232). For access outside Canada, please consult the Canada site (www.canada.gc.ca/directories/infor_e.html) for international toll-free numbers.

National Climate Change Web Sites

Government of Canada Climate Change Site: http://www.climatechange.gc.ca
National Climate Change Secretariat: http://www.nccp.ca
Environment Canada's Green Lane: http://www.ec.gc.ca
- Atmospheric Environment Service: http://www1.tor.ec.gc.ca/index.html
- Canadian Centre for Climate Modelling and Analysis: http://www.cccma.bc.ec.gc.ca/eng_index.html
- Climate Trends and Variations Bulletin: http://www.tor.ec.gc.ca/ccrm/bulletin/
- Cryospheric System to Model Climate Change in Canada: http://www.tor.ec.gc.ca/crysys/
- Mackenzie GEWEX Study: http://www.tor.ec.gc.ca/GEWEX/MAGS.html
- Science Assessment of Climate Change: http://www.tor.ec.gc.ca/apac/
- The Canada Country Study: http://www.ec.gc.ca/climate/ccs/

Natural Resources Canada: http://www.nrcan.gc.ca/
- Canadian Forest Service: http://www.nofc.forestry.ca/climate
- Geological Survey of Canada: http://sts.gsc.nrcan.gc.ca/page1/clim/
- Geomatics Canada: http://www.ccrs.nrcan.gc.ca/ccrs/tekrd/rd/apps/em/cchange/ccemse.html
- Office of Energy Research and Development: http://www.nrcan.gc.ca/es/new/oerd.htm

Agriculture and Agri-Food Canada: http://www.agr.ca/envire.html
- Healthy Air: http://www.agr.ca/research/Healthy_Air/toc.html

Fisheries and Oceans:
- The Oceans' Role in Climate Change: http://csas.meds.dfo.ca/aosb/Oceans/Welcome.htm

Health Canada: http://www.hc-sc.gc.ca/english/climate.htm
National Roundtable on the Environment and the Economy: http://www.nrtee-trnee.ca

Provincial/Territorial Web Sites

Alberta: http://www.climatechange.gov.ab.ca/
British Columbia: http://www.elp.gov.bc.ca/epd/epdpa/ar/
Manitoba: http://www.gov.mb.ca/environ/index.html
New Brunswick: http://www.gov.nb.ca/environm
Newfoundland and Labrador: http://www.gov.nf.ca/env/Labour/OHS/default.asp
Northwest Territories: http://www.gov.nt.ca
Nova Scotia: http://www.gov.ns.ca
Nunavut: http://www.inac.gc.ca/nunavut/index.html
Ontario: http://www.ene.gov.on.ca
Prince Edward Island: http://www.gov.pe.ca/te/index.asp
Quebec: http://www.mrn.gouv.qc.ca
Saskatchewan: http://www.gov.sk.ca
Yukon: http://www.gov.yk.ca

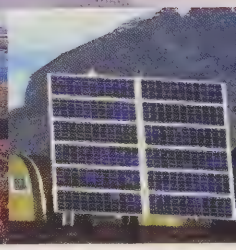
Additional Canadian Science Web Sites

Canadian Institute for Climate Studies: http://www.cics.uvic.ca/
- Canadian Climate Research Network: http://www.cics.uvic.ca/climate/crn/crn.htm

A Compendium of

Canadian Initiatives

Taking Action on Climate Change



OCTOBER 2000

National
Climate
Change
Process

A Compendium of Canadian Initiatives: Taking Action on Climate Change
ISBN 1-894686-45-4

Ce document est également offert en français sous le titre :
Recueil de mesures canadiennes : Agir pour contrer le changement climatique.

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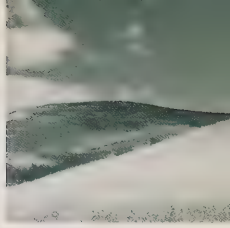


Introduction

The world's climate is changing. Canada, like countries throughout the world, is concentrating on how to reduce the greenhouse gas emissions that are accumulating in the atmosphere to address climate change and adapt to the degree of change that is projected.

Our task is complicated by the fact that Canada is a vast country, with enormous distances separating many of our cities and extreme temperatures in both winter and summer. A growing population, an expanding and energy-intensive economy, and an increase in exports also play a role in our emissions.

In 1998, Canada's greenhouse gas emissions were 13 percent above 1990 levels. However, the growth in emissions is slowing. In the mid-1990s, our greenhouse gas emissions were growing at about 3 percent per year. In 1997, the rate slowed to 1.8 percent and in 1998, the last year for which complete data are available, the rate was 1 percent. In 1998, Canada's economy grew 4.4 percent.

Canada has also made significant gains in energy efficiency in many sectors of the economy over the past decade. Overall energy efficiency improved by 6.2 percent between 1990 and 1997, with an annual reduction of greenhouse gas emissions of 24 megatonnes from what would otherwise have been the case.

Many of these gains in energy efficiency are the result of investments made by Canadian businesses and industry in processes and technologies that reduce emissions while increasing economic competitiveness. For example, Canada's pulp and paper industry reduced its emissions by 12 percent between 1990 and 1997, while increasing its production volume by 21 percent over the same period.

Canada's federal, provincial, territorial and municipal governments have been addressing the challenge of climate change for more than a decade. They have developed and carried out their own programs and provided support to projects of private sector and non-governmental organizations. These activities, along with voluntary actions undertaken by the private sector, are projected to reduce Canada's greenhouse gas emissions by 60 megatonnes from where they would otherwise have been by 2010. Without these initiatives, our projected emissions would be about 8 percent higher in 2010.

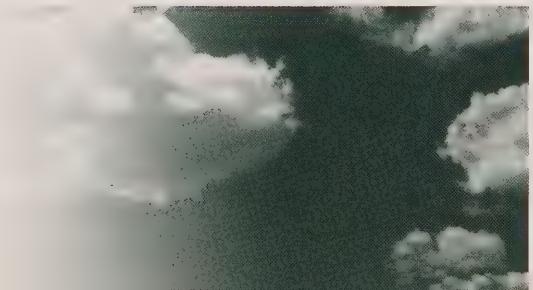
Canada's governments are fundamentally in agreement about how to respond to climate change and are taking action in a flexible way that respects jurisdictional authorities while facilitating cooperation among jurisdictions. Initiatives such as the Climate Change Action Fund, an initiative of the Government of Canada, and Climate Change Central, an initiative of the Government of Alberta, have brought together all partners in the climate change process to help develop solutions that reduce emissions while creating opportunities for Canadians.

This compendium showcases Canadian climate change initiatives by all levels of government across Canada. They are grouped into the following five categories, which parallel Canada's National Implementation Strategy on Climate Change and First National Climate Change Business Plan:

- Encouraging Action
- Promoting Technology Development and Innovation
- Enhancing Awareness and Understanding
- Governments Leading by Example
- Investing in Knowledge and Building the Foundation

An index of programs by jurisdiction can be found at the end of this compendium.

The compendium is not intended to be a complete listing of climate change programs and initiatives in Canada. Many municipal governments, institutions, businesses and non-governmental organizations have also dedicated resources to reducing greenhouse gas emissions. The Government of Canada climate change Web site (www.climatechange.gc.ca) provides links to these organizations' sites and to other climate change sites in Canada and throughout the world.



Across Canada, Canadians are acting to reduce emissions in all sectors of the economy and in all aspects of their lives. Governments are supporting them in these efforts, by creating incentives to appropriate technological choices and behavioural change; removing barriers; and supporting voluntary action and international activities. Programs focus on sectors ranging from agriculture, to buildings, to industry, to transportation, to municipalities.

Encouraging Action

TRANSPORTATION

Government of Canada

Alternative and Future Transportation Fuels

The Alternative and Future Transportation Fuels program encourages the development, production and use of alternative and future vehicle and fuels technologies. The focus is on a number of fuels, including propane, natural gas, and alcohols, as well as on electricity and hydrogen. The program provides support to fleet operators in the public and private sectors through economic and market studies, emissions and safety assessments; market demonstration, communications and awareness activities, and general and technical information about fuel options in Canada. The program also sponsors workshops with the industry and other governments to review market, technical and policy issues.

Natural Resources Canada,
http://oee.nrcan.gc.ca
Peter Reilly-Roe, (613) 996-6001,
peterrr@nrcan.gc.ca

Auto$mart Program

The Auto$mart Program promotes energy-efficient practices among Canadian motorists through publications, events, joint projects and a Student Driver Kit available to driver trainers across Canada. Motorists also receive helpful tips on buying, driving and maintaining their vehicles to reduce fuel consumption and greenhouse gas emissions.

Natural Resources Canada,
http://oee.nrcan.gc.ca
Catherine Ray, (613) 995-5264, cray@nrcan.gc.ca

EnerGuide for Vehicles

The EnerGuide for Vehicles program provides prospective new-vehicle buyers with information on energy consumption and costs to enable them to compare and purchase the most fuel-efficient vehicle that meets their needs. The EnerGuide for Vehicles tools include the *EnerGuide Label* (on all new vehicles sold in Canada), the *Fuel Consumption Guide* (a complete listing of fuel consumption information for all new vehicles), and the *EnerGuide for Vehicles Awards* (which recognize the most fuel-efficient vehicles in different categories).

Natural Resources Canada,
http://oee.nrcan.gc.ca
Charles Villeneuve, (613) 947-7788,
chvillen@nrcan.gc.ca

Excise Tax Exemption

The federal excise tax exemption for alcohol-blend gasoline or aviation gasoline, maintained in the 2000 Government of Canada Budget, provides for a proportionate reduction in the excise tax payable in cases where gasoline or aviation gasoline have been blended with alcohol to produce a gasoline-alcohol fuel or an aviation gasoline-alcohol fuel, containing less than 1.35 percent alcohol by volume. The exemption applies to the portion of ethanol and methanol (alcohols) blend produced from biomass or renewable feedstock. For example, a 10 percent methanol-gasoline blend would qualify for a 10 percent reduction in the existing fuel excise tax rate of 10 cents per litre (equivalent to 1 cent per litre) while a 20 percent blend would qualify for a 2 cent rate reduction (equivalent to 8 cents per litre tax instead of 10 cents). The exemption does not apply to ethanol or methanol produced from petroleum, natural

gas, or coal. The federal excise tax does not apply to propane or compressed natural gas when these are used as transportation fuels.

Department of Finance, www.fin.gc.ca
Francine Noftle, (613) 992-3246,
noftle.francine@fin.gc.ca

FleetSmart
The FleetSmart program helps fleet managers reduce fuel costs and vehicle emissions through energy-efficient practices. The program develops energy-use data and profiles for fleet segments and provides a range of products such as an energy management tool kit, success stories and case studies that identify best practices, and a SmartDriver training initiative.

Natural Resources Canada,
http://oee.nrcan.gc.ca
Bob Smith, (613) 992-9608,
bobsmith@nrcan.gc.ca

Intelligent Transportation System (ITS) Plan for Canada: En Route to Intelligent Mobility
This Plan sets out the Government of Canada's strategy for stimulating the development and deployment of these systems across urban and rural Canada. The goals are to maximize the use and efficiency of existing infrastructure and to meet future mobility needs more responsibly. The ITS Plan provides leadership and support to advance the application and compatibility of ITS technologies to make Canada's multimodal ground transportation system safe, integrated, efficient, and sustainable. To accelerate the deployment, integration, and interoperability of ITS across all modes, the Government of Canada will provide funding for ITS deployment and integration to lever complementary public and private sector investment.

Transport Canada,
www.tc.gc.ca/pol/en/its/menu_e.htm
Theresa Spadaccini, (613) 991-6441,
spadact@tc.gc.ca

Moving On Sustainable Transportation (MOST)
The Moving on Sustainable Transportation Program has been established to support projects that produce the kinds of education, awareness and analytical tools Canada needs if we are to make sustainable transportation a reality. The MOST Program provides funding to help support projects that will provide Canadians with practical information and tools to better understand sustainable transportation needs; encourage the creation of innovative ways to promote sustainable transportation; and achieve quantifiable environmental and sustainable development benefits.

Transport Canada,
www.tc.gc.ca/envaffairs/MOST/Main_e.htm
Renetta Siemens, (613) 993-1869,
siemenr@tc.gc.ca

Natural Gas for Vehicles
The Natural Gas for Vehicles program, for regions of Canada serviced by Alberta natural gas, is an incentive program designed to encourage the production and use of natural gas vehicles. The program contributes $2,000 for each factory-built natural gas vehicle and $500 for road vehicles converted to natural gas. The program also encourages the development of new refuelling outlets, cost-shared marketing and awareness activities, and co-funded research and development. The program continues until January 31, 2002.

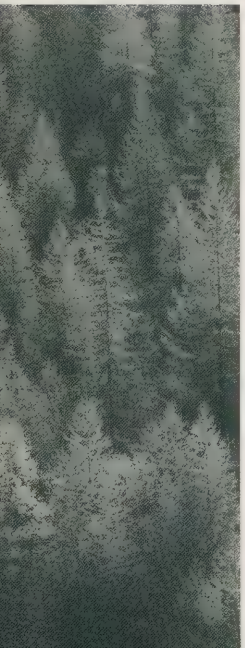
Natural Resources Canada,
http://oee.nrcan.gc.ca
Peter Reilly-Roe, (613) 996-6001,
peterrr@nrcan.gc.ca

Vehicle Fuel Efficiency Program
The Vehicle Fuel Efficiency program promotes improvements in vehicle fuel efficiency by encouraging motor vehicle manufacturers to meet voluntary annual company average fuel consumption targets for new automobiles sold in Canada. Working with vehicle manufacturers through a voluntary Memorandum of Understanding on vehicle fuel efficiency, this initiative focuses on opportunities to improve vehicle fuel technology and provide information to consumers on the fuel efficiency of vehicles.

Natural Resources Canada,
http://oee.nrcan.gc.ca
Marie Schingh, (613) 995-8401,
mschingh@nrcan.gc.ca

British Columbia

Consultation on Options to Reduce Greenhouse Gases from Light Trucks and Passenger Vehicles
British Columbia is consulting with stakeholders to identify and evaluate options to reduce greenhouse gas emissions from passenger vehicles and light trucks, including the option of a feebate system based on vehicle fuel efficiency. A Discussion Paper outlining



the options and implications will be released in fall 2000 and will be available on the Ministry of Finance and Corporate Relation's website.

> Ministry of Finance and Corporate Relations,
> www.fin.gov.bc.ca
> Glen Armstrong, (250) 387-4196,
> glen.armstrong@gems2.gov.bc.ca

Development of Cycling Networks in Municipalities and Cycling Corridors between Municipalities
The BC Transportation Financing Authority invests $2 million annually to develop cycling networks on a 50/50 cost-shared basis with local governments. Cycling Network Program funding for 2000-2001 is $1.73 million to 27 communities. The Government of British Columbia is integrating cycling by providing safe, accessible, and convenient bicycle facilities on provincial highways and by publishing a Cycling Policy. In addition, the province has committed $5 million ($3.5 million in 2000-2001) toward development of the Trans Canada Trail.

> Ministry of Transportation and Highways,
> www.th.gov.bc.ca/bchighways/cycling/bicycle.htm
> Communications Branch, (250) 387-7788,
> www.gov.bc.ca/th/cont/ (e-mail via website)

Gasoline and Diesel Tax for Public Transit
A gasoline and diesel tax is collected by British Columbia on behalf of certain public transit authorities for transit funding (i.e. 4 cents per litre in the Greater Vancouver Regional District, and 2.5 cents per litre in Greater Victoria), in addition to the general fuel tax on gasoline and diesel.

> Ministry of Finance and Corporate Relations,
> www.fin.gov.bc.ca/revenue/ctb/MoreTopics.htm
> (See Bulletin 85)
> Dave Barnett, (250) 387-9072,
> dave.barnett@gems9.gov.bc.ca

High-Occupancy Vehicle (HOV) and 'Bus Only' Lanes
British Columbia anticipates spending approximately $21 million in fiscal year 2000-01 on HOV lane projects to encourage the use of buses, van/carpools and other high-occupancy vehicles in the Lower Mainland.

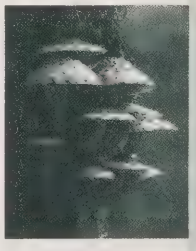
> Ministry of Transportation and Highways,
> www.th.gov.bc.ca/BCHighways/capehorn/
> capehorn.htm
> Communications Branch, (250) 387-7788,
> www.gov.bc.ca/th/cont/ (e-mail via website)

Selected Intelligent Transportation Systems (ITS)
To improve traffic flows in selected situations, the Traffic Management Plan Pilot Project includes an advanced traveller warning system and accident response process on the Trans Canada Highway through the Lower Mainland. A Commercial Vehicle Operations (CVO) Strategic Plan is being developed. Development of an ITS Strategic Plan is expected to be initiated this year as well as the Traffic Management Plan Pilot Project which involves incident management and traveller information systems on the Trans-Canada Highway.

> Ministry of Transportation and Highways,
> Communications Branch, (250) 387-7788,
> www.gov.bc.ca/th/cont/ (e-mail via website)

Long-Term Tax Policy for Alternative Fuels
British Columbia is implementing a long-term general tax policy for all alternative motor fuels. Under the policy, tax rates on alternative motor fuels will be phased in, based on market share and environmental benefits, with the maximum tax rate below the gasoline tax rate. This will provide suppliers and consumers of alternative fuels with certainty that alternative fuels will receive preferential tax treatment over the long-term, to encourage the development and distribution of these fuels and the purchase of alternative-fuel vehicles.

> Ministry of Finance and Corporate Relations
> www.fin.gov.bc.ca/revenue/ctb/MoreTopics.htm
> (See Bulletin 85)
> Dave Barnett, (250) 387-9072,
> dave.barnett@gems9.gov.bc.ca



Motor Assisted Bicycles
Legislation passed in 2000 in British Columbia encourages people to use motor-assisted bicycles as an alternative mode of transportation. (Such bicycles are fitted with an accessory motor kit for use up hills or when needed.) Under the amendment to the Motor Vehicle Act, people riding motor-assisted cycles will not need vehicle registration, licences or insurance.

> Bill Mumford, (250) 414-7902,
> bill.mumford@icbc.com

Motor Fuel Tax Exemptions for Alternative Fuels
British Columbia provides a motor fuel tax exemption for natural gas and 85 percent ethanol and methanol blends of fuel used in motor vehicles. There is also a preferential tax rate for auto-propane of 7 percent of the price, significantly lower than the gasoline tax rate on an energy equivalent basis. A tax exemption will be

provided for the ethanol used in lower-level gasoline-ethanol blends once a commercial-scale ethanol plant is in operation in the province.

Ministry of Finance and Corporate Relations
www.fin.gov.bc.ca/revenue/ctb/MoreTopics.htm
(See Bulletin 85)
Dave Barnett, (250) 387-9072,
dave.barnett@gems9.gov.bc.ca

Partial Sales Tax Rebate for Factory-Produced Alternative-Fuel Vehicles and Vehicle Conversions

British Columbia provides a provincial sales tax refund of up to $500 for purchases of eligible new factory-manufactured alternative-fuel vehicles and up to $5000 for eligible alternative-fuel passenger buses. Kits and installation labour to convert existing motor vehicles to operate on alternative fuels such as propane, natural gas and electricity are also exempted from provincial sales tax.

Ministry of Finance and Corporate Relations
www.fin.gov.bc.ca/revenue/ctb/MoreTopics.htm
(See Bulletin 85)
Glen Armstrong, (250) 387-4196,
glen.armstrong@gems2.gov.bc.ca

Regional Growth and Transportation Demand Management (TDM) Strategies

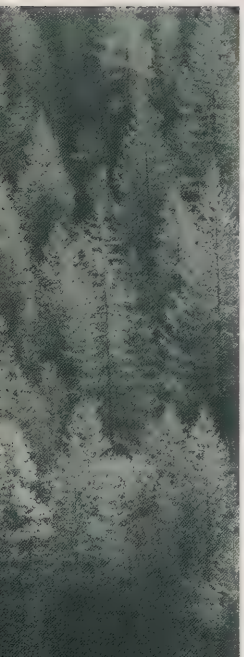
British Columbia is providing technical support to local and regional governments in the main urban growth areas (Lower Mainland, Okanagan Valley and Greater Victoria) to help develop regional growth and transportation demand management strategies, aimed at designing settlement patterns and transportation modes that decrease vehicle use and shorten travel distances.

Ministry of Transportation and Highways,
Communications Branch, (250) 387-7788,
www.gov.bc.ca/th/cont/ (e-mail via website)

SkyTrain Expansion

British Columbia has committed $1.2 billion to build SkyTrain's new Millennium Line, a 21-km line linking New Westminster and Vancouver via the Lougheed and Broadway corridors. It is also reviewing the feasibility of future connections to other Lower Mainland cities, including a line connecting Port Moody and Coquitlam, and another west of Vancouver Community College.

Rapid Transit Project 2000 Ltd.
www.rapidtransit.bc.ca
Information Services, (604) 739-6985,
info@rapidtransit.bc.ca



Alberta

Transit Enhancement

Two transit measures, bus renewal and LRT expansion, are aimed at increasing transit use in urban centres through provincial and federal government funding to improve transit service and expand infrastructure. Calgary and Edmonton have identified transit bus renewable and LRT expansion as investment areas in their respective transportation infrastructure investment plans. Funding for these measures has been secured through the new provincial allocation of fuel tax revenue to Edmonton and Calgary.

Lawrence Schmidt, (780) 415-0682
lawrence.schmidt@gov.ab.ca

Saskatchewan

Short-Line Railway Advisory Program

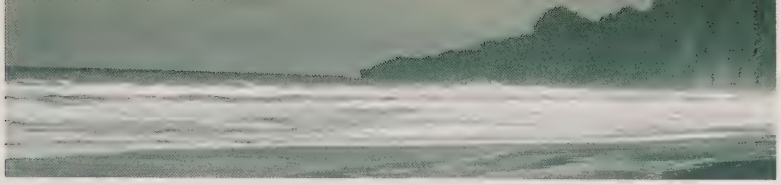
This program provides technical, marketing and legal advice to groups interested in setting up short-line railways. Its objectives include reducing grain producers' transportation cost relative to truck transportation; minimizing damage to thin pavements due to heavy grain truck traffic; and reducing the taxation burden on rural residents associated with the elimination of railways and elevators. Six short-line railways are currently in operation, with a seventh in the process of being established. Total short-line trackage is expected to reach 1200 km by the end of the year.

Ed Zsombor, (306) 787-5847,
ed.zsombor.hi@govmail.gov.sk.ca

Trucking Partnership Program

The program provides an opportunity for companies to improve the efficiency of their hauling operation by allowing loads in excess of weights and/or lengths that can be legally hauled on the provincial highway system. The companies must meet specific operational requirements including the sharing of haul savings with the Department of Highways and Transportation. The objectives of the program are to support economic development in Saskatchewan; provide additional revenues for road improvement; promote the use of more efficient, road friendly vehicle technology; and ensure that the taxpayers and motoring public are not adversely affected by industrial traffic.

John Palaschuk, (306) 787-4846,
john.palaschuk.hi@govmail.gov.sk.ca



Volatile Organic Compounds Reduction
The Saskatchewan Department of Highways and Transportation is reducing emissions of volatile organic compound emissions by cutting down the use of Trichlorocltrylene in asphalt testing; promoting the use of emulsified asphalt instead of cutting back ashphalt where possible; and increasing the use of water-based paint on road striping.

Magdy Beshara, (306) 787-4922,
mbeshara@highways.gov.sk.ca

Quebec

Employer Program
The Quebec Department of Transport has developed a transport plan for businesses that includes a wide range of measures to facilitate travel by employees between home and the workplace. It is designed to bring about change in travel habits by promoting public transport and ride-sharing, and rethinking the management of parking lots, etc.

Department of Transport, www.mtq.gouv.qc.ca
Christine Duby, (514) 864-1730 ext 261

Public Transit Program
The program is designed to create conditions in the cores of major urban areas to encourage use of public transit as the main mode of travel, as well as encouraging the maintenance and development of efficient networks and services. The capital investment aspect of the program is designed to encourage maintenance of assets, improve infrastructures and expand networks.

Department of Transport,
www.mtq.gouv.qc.ca/ministere/programmes/c11.htm
Robert Carignan, (418) 644-0316 or
Christian Crête, (418) 643-7896

Prince Edward Island

Advanced Traveller System (ATIS) for PEI
Well-informed travellers make better travel decisions, which usually translates into more efficient travel patterns. A traveller information system distributes information on weather, road conditions, construction zones, detours, and congestion by means of radio broadcasts, variable message signs, web pages and/or other media. The PEI Department of Transportation and Public Works is investigating ATIS, and is seeking ways to distribute existing information easily.

www.gov.pe.ca/mapguide/index.php3
Cathy Worth, (902) 894-0271,
ceworth@gov.pe.ca

Greater Charlottetown
Synchronized Traffic Signal System
Improving traffic flow through intersections through the application of Intelligent Transportation Systems (ITS) reduces vehicle emissions by minimizing idling times at red lights. Phase I, the widening of the intersection on the Charlottetown Perimeter Highway to allow for two through lanes in each direction, has been completed, implementing time-based signal co-ordination along the entire section of highway. Phase II will expand the system to include University Avenue. If funding becomes available and the City of Charlottetown is on-side, implementation of Phase III will include the upgrading of the entire signalized network system (approximately 40 signalized intersections) to be fully adaptive for all signalized intersections in the greater Charlottetown area.

Helen Blake, (902) 566-5155, heblake@gov.pe.ca

PEI Enerpool
The program objective is to demonstrate the energy conservation potential through ride-sharing. The Energy and Minerals Section of the PEI Department of Development & Technology sponsors two vans that provide weekday transportation to and from Charlottetown, Prince Edward Island.

Jessie MacPhail, (902) 368-5010,
jmmacpha@gov.pe.ca

Road Weather Information System (RWIS)
Improved knowledge of specific road conditions (temperature, moisture, wind speed, salt concentration) greatly improves road condition forecasting ability. RWIS enhances highway maintenance decision-making ability, leading to more efficient use of the highway maintenance fleet. Accurate, timely, and specific road condition information can pinpoint problem areas and dispatch equipment accordingly.

Cathy Worth, (902) 894-0271,
ceworth@gov.pe.ca

Nova Scotia

TRAX (Transportation Halifax)
TRAX is a public education program to reduce the use of private vehicles, and encourage mass transportation/car pooling/walking/bicycling as viable healthy alternatives. Several major employers in the core of Halifax will be assisted in setting up in-house programs. Existing efficient public transportation initiatives will be supported and efforts undertaken to change/introduce legislation that will encourage more efficient public transportation. Partnership with the health field will emphasize the negative aspects of personal vehicles and the positive aspects of alternatives.

Sue Watson/Rebecca O'Brien, (902) 429-0924,
TRAX@istar.ca.

ELECTRICITY

Government of Canada

Capital Cost Allowance (CCA) and Related Changes
These changes, introduced in Government of Canada Budgets between 1996 and 2000, make several adjustments that will directly or indirectly encourage investment in certain types of energy-efficiency and renewable-energy technologies. The changes include:

I. Extending higher CCA rates (i.e. 30 percent) to equipment used in photovoltaic systems with lower minimum peak capacity requirements (i.e. 3 rather than 10 kiloWatts);
II. Allowing the deduction of 100 percent of certain pre-production costs in the renewable-energy projects. These costs can also be renounced to shareholders under flow-through share agreements, providing improved access to financing in the early stages of a project when there is little or no income against which tax deductions related to these expenses can be applied;
III. Including test wind turbines as pre-production expenses eligible for flow-through;
IV. Increasing the CCA rates for a distributor of heat or water from 4 percent to 8 percent for production and distribution equipment (other than buildings and other structures);
V. Extending the separate class election to include natural gas turbines. This separate class election allows taxpayers to fully deduct any remaining undepreciated balance as a terminal loss upon the disposition of all the property in that class, including used equipment; and
VI. Extending higher CCA rates (i.e. 30 percent) for electricity-generating equipment fuelled by flare gas at oil fields. (This incentive helps to reduce greenhouse gas emissions in the oil and gas industry by better controlling the combustion process and by displacing coal-fired electricity generation.)

Department of Finance, www.finance.gc.ca
Bill Toms, (613) 992-0960, toms.bill@fin.gc.ca

EnerGuide for Equipment
The EnerGuide for Equipment program ensures that new major household appliances and room air conditioners comply with Canada's *Energy Efficiency Act* and show an EnerGuide label — either a yearly energy consumption rating (major household appliances) or an energy-efficiency ratio (air conditioners). All ratings are based on standard test procedures. Labelling helps consumers obtain consistent and reliable information on energy performance.

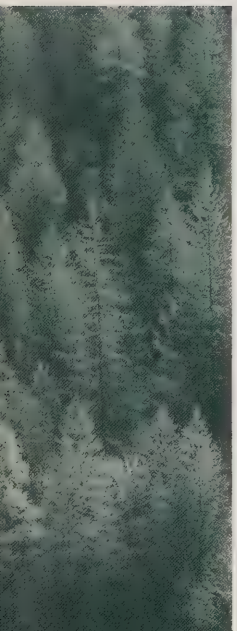
Natural Resources Canada,
http://oee.nrcan.gc.ca
Anne Wilkins, (613) 992-3900,
awilkins@nrcan.gc.ca

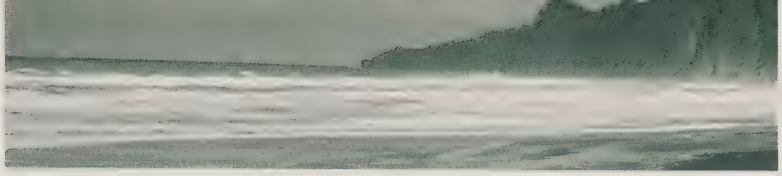
Energy-Efficient Equipment and Appliances
The Energy-Efficiency Regulations, created by regulations authorized under the *Energy Efficiency Act*, aim to eliminate inefficient energy-using equipment from the Canadian market by prescribing minimum energy-efficiency performance levels.

Natural Resources Canada,
http://oee.nrcan.gc.ca
John Cockburn, (613) 996-4359,
jcockbur@nrcan.gc.ca

Extension of the Manufacturing and Processing (M&P) Tax Credit
The extension of the 7 percent M&P tax credit to electricity generation, announced in the 1999 Government of Canada Budget, will encourage investment in new electrical generating capacity. A related change in Budget 2000 will encourage district heating by providing the same income tax rate to all producers of steam for sale for uses other than the generation of electricity.

Department of Finance, www.finance.gc.ca
Bill Toms, (613) 992-0960, toms.bill@fin.gc.ca





British Columbia

BC Hydro Greenhouse Gas Initiatives

B.C. Hydro has undertaken several initiatives designed to reduce greenhouse gas emissions:

- **Request for Green Power** is a commitment to making 10 percent of all BC Hydro's new generation resource acquisitions green resources (i.e. renewable, socially responsible, licensable, and having a low environmental impact).
- The **Energy Futures Program** identifies realistic green energy options, including green energy supplies, new products or services, and new business ventures. Options being considered are wind, micro-hydro, woodwaste, community energy planning, and green energy certification. Two wind monitors have been installed to evaluate wind viability and three more will be installed across the province in the next year.
- **Power Smart** is a customer energy-efficiency program. BC Hydro is also increasing the energy efficiency of its own operations and facilities; for example, improving hydroelectric generation efficiency (Resource Smart program) and upgrading the Burrard Thermal Generating Plant. It has also committed more than $2 million for the purchase of greenhouse gas offsets over the 2000-2001 time frame.

BC Hydro, www.bchydro.com/environment
Kristann Boudreau, (604) 623-3536,
kristann.boudreau@bchydro.bc.ca

Alberta

ATCO Electric

- **ASHCORT Technologies Ltd.** is a new subsidiary company for marketing ash. Ash sales increased by more than 50 percent in the company's first year of operation.
- **Promoting energy efficiency** – Some of Atco Electric's internal energy efficiency projects include a solar power installation at its Anderson substation, a turbine efficiency upgrade at its Sheerness station, a fuel pipe refurbishment and coal bunker modifications at its H.R. Milner station and the purchase of more fuel efficient vehicles for company use. In addition, ATCO Electric works with customers to enhance the efficient use of energy in their homes and businesses, has developed partnerships with communities to share ideas and address local environmental concerns and has developed educational materials, which are used by schools and other groups in its service area.

www.atcoelectric.com

EPCOR

- **EnVest™** is an energy efficiency program that can enable commercial and industrial customers to reduce their energy consumption. EPCOR developed EnVest™ to allow commercial and industrial customers to reinvest in themselves. The program allows commercial and industrial customers to avoid the large capital requirements traditionally needed for energy and water saving upgrades to existing facilities. By becoming a partner in the EnVest™ program, commercial and industrial customers can access all the resources required for major energy improvements to their current water, gas and electric systems. The program also shows commercial and industrial customers how to decrease their operating costs, limit the impact of their operations on the environment, and access affordable financing to cover project costs.

www.epcor-group.com,
envest@epcor.com

- **Flyash** – Coal flyash is the light airborne particulate that is produced by coal-fired power plants. It has physical and chemical properties that resemble limestone, which is used to make cement. These properties allow flyash to displace limestone in concrete production. Flyash has been found to increase the long-term strength and durability of cement. Using flyash in place of limestone reduces the need for disposing it in a landfill, avoids the cost of landfilling and generates revenues when sold. It also results in less energy consumed in concrete production. In 1999, EPCOR sold 61,918 tonnes of ash for cement production. This represents a net carbon dioxide reduction of 31,000 tonnes.

www.epcor-group.com

- **Harvesting Power Poles** – In August 1996, EPCOR entered into an agreement with Moen Lumber Sales of Edmonton to recycle used cedar power poles. Moen sells the poles, which displace virgin lumber in the retail market. This has resulted in numerous benefits. Used power poles are no longer sent to the landfill, which means fewer trees are harvested

and the energy consumption associated with harvesting is reduced. In 1999, this program resulted in 20,000 tonnes of carbon dioxide emissions reductions. Carbon dioxide offsets associated with the resulting displaced forestry, and avoided greenhouse gas emissions and root system impacts are estimated at an additional 124,00 tonnes per year.

www.epcor-group.com

- **Landfill Gas** – Methane gas from Clover Bar Landfill is used as an alternative energy source to produce electricity at EPCOR's Clover Bar Generating Station. More than 70 active wells from a total of more than 110 wells at the Clover Bar Landfill produce 39,000 cubic metres of landfill gas each day. The methane gas used at Clover Bar generates electricity at an average rate of 5,700 kiloWatts of net electrical power, enough to satisfy the power needs of 4,100 homes.

  www.epcor-group.com,
  Tim Boston, (780) 412-3268

- **Standing Up For Trees** – EPCOR joined with 40 other Canadian and American utilities to form the UtiliTree program. The goal of the UtiliTree Carbon Company is to promote ecologically and economically sustainable forest management. It sponsors projects such as tree planting, forest protection and innovative forest management that result in the storage of carbon. EPCOR's participation in the UtiliTree project offset 16,200 tonnes of carbon dioxide in 1999.

  www.epcor-group.com

TransAlta

- **Ash Sales** – TransAlta sold approximately 16 percent of the fly ash from their coal-fired generating plants to Alberta and British Columbia cement companies in 1999. This represented 348,618 tonnes of ash, reducing CO_2 emission by 20,357 tonnes.

  www.transalta.com,
  sustainable_development@transalta.com

- **Offsets** – TransAlta has signed an agreement to purchase up to 2.8 million metric tonnes of carbon emission reduction credits from farms in the United States. Credits from these reductions will be delivered to TransAlta beginning in 2008. TransAlta led a consortium of seven Canadian companies involved in the deal through the Greenhouse Emissions Management Consortium (GEMCo).

  www.transalta.com,
  sustainable_development@transalta.com

- **Renewable Purchases** – TransAlta purchases renewable energy in Alberta through the Small Power Research and Development Act. Through this program, TransAlta has signed long-term power purchase contracts at legislated prices with various independent renewable energy producers. In 1999, TransAlta purchased 573,806 megaWatt hours of electricity generated by wind, biomass and small hydro operations.

  www.transalta.com,
  sustainable_development@transalta.com

Saskatchewan

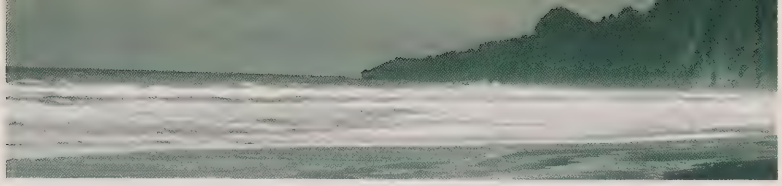
SaskEnergy's Climate Change Initiative

SaskEnergy set in motion efforts to reduce corporate greenhouse gas emissions eight years ago. The corporation continues to roll out the top, cost-effective projects that were identified by its internal Climate Change Task Force, and searches for new and additional ways to reduce its impact on the environment. SaskEnergy is a third of its way toward its goal of reducing its greenhouse gas emissions to 6 percent below 1990 levels by the year 2005, when many of these projects will be substantially completed. In addition to its internal initiatives, SaskEnergy is a strong supporter of provincial initiatives to educate the public, improve the energy efficiency of Saskatchewan businesses and the public, and help them reduce their greenhouse gas emissions. These initiatives consist of Action By Canadians (ABC) workshops, natural gas vehicle conversions, the Government of Canada's R-2000 HOME Program, industrial and commercial building energy management programs, and various research and development initiatives. SaskEnergy also has a program in place that will finance the purchase of natural gas appliances.

SaskEnergy, www.saskenergy.com
Bernard Ryma, (306) 777-9368,
bryma@saskenergy.sk.ca

SaskPower's Climate Change Action Plan Initiative

SaskPower has adopted a four-pronged approach to mitigation of greenhouse gases. Internally, SaskPower



is striving to improve efficiencies, while customer programs include the Energy Solutions program and participation in the Actions By Canadians (ABC) Program. Offset projects include those initiated through GEMCo as well as the SERM forest offset project and others in various stages of development. Research and development has focused on clean coal technology, the capture and storage of CO_2 and terrestrial carbon sequestration.

SaskPower, www.saskpower.com
Cynthia Edwards, (306) 566-3247,
cedwards@saskpower.com

New Brunswick

Cogeneration Policy

New Brunswick has developed a cogeneration policy to encourage the purchase of electricity by the utility in cases where an industry is modernising or expanding. In 1996, 38.5 megawatts of biomass-fuelled generation was added to the New Brunswick Power system. The project reduces annual CO_2 emissions by 250 kilotonnes. Opportunities to increase the level of cogeneration are continually being sought.

Darwin Curtis, (506) 453-2206,
darwin.curtis@gnb.ca

Energy Efficiency Standards for Equipment

The objective of this program is to improve the energy efficiency of selected products and eliminate the use of inefficient ones. A total of 23 types of equipment such as refrigerators, washers, electric motors and lighting are regulated for minimum energy-efficiency levels under the *Energy Efficient Act*.

Rejean Thibodeau, (506) 453-2206,
rejean.thibodeau@gnb.ca

Yukon

Power Sales Incentive Program

This program encourages the use of surplus renewable electricity to displace fossil fuels used for space and water heating. The program will guarantee a return on investment to customers who install the equipment necessary to purchase secondary power.

www.yec.yk.ca/
Duncan Sinclair, (867) 393-5334,
duncan.sinclair@yec.yk.ca

Northwest Territories

Development of Residual Heat Systems

The Northwest Territories Power Corporation operates diesel engine-driven electrical generating plants in most communities in the Northwest Territories (and also in Nunavut). Heat from the cooling of the generators is used to reduce the amount of heating oil consumed by nearby commercial and institutional buildings. Systems are installed where it is feasible to do so. The Power Corporation has signed a Memorandum of Understanding with the territory's Department of Public Works and Services to cooperate in these installations.

www.gov.nt.ca/pws/index.htm
www.ntpc.com/index.htm
Joe Auge, (867) 873-7829, joe_auge@gov.nt.ca

Northwest Territories Power Corporation's VCR Action Plan

The Northwest Territories Power Corporation operates diesel engine-driven electrical generating plants in most communities in the Northwest Territories. In October 1999, the Corporation filed an action plan with the Voluntary Challenge and Registry (VCR). Initiatives identified in the latest plan include wind energy conversions; residual heating systems; efficient diesel engines, programmable logic controllers, natural gas generating facilities, energy-efficient street lighting, transmission and distribution lines, energy-efficient initiatives, continued involvement in the Arctic Energy Alliance, and continued involvement in the VCR program.

www.ntpc.com/index.htm
Engineering Division, Northwest Territories
Power Corporation, (867) 874-5282

INDUSTRY

Government of Canada

Canadian Industry Program for Energy Efficiency (CIPEC)

The Canadian Industry Program for Energy Efficiency (CIPEC), a voluntary industry-government alliance, provides a framework to identify energy-efficiency potential, establish energy-efficiency improvement targets, implement and manage energy-efficiency improvement programs and projects, report on progress and celebrate accomplishments. The Government of Canada also works with companies through its Industrial Energy

Innovators Initiative (see description below.) CIPEC includes 35 trade associations, representing more than 3,000 companies and 90 percent of secondary industrial energy demand. Industry members under CIPEC include the following sectors: aluminum, brewery, cement, chemicals, dairy, electrical and electronics, fertilizer, food processing, general manufacturing, lime, mining, oil sands, petroleum products, pulp and paper, rubber, soft drink, steel, textiles, transportation manufacturing, and wood products. Industries participating in CIPEC recorded an average annual energy-efficiency improvement of 1.3 percent for the period 1990–1998, while stabilizing energy-related emissions of CO_2. This improvement represents the amount of energy necessary to heat 40 percent of all Canadian houses in 1998. Two examples of individual company energy savings include, in the aluminum sector, Aluminerie Lauralco (300,000 megawatts with increased production of five percent) and, in the mining/smelting sector, Cominco (zinc/copper), a total greenhouse gas reduction of 40 percent since 1989. Examples of CIPEC projects are listed below.

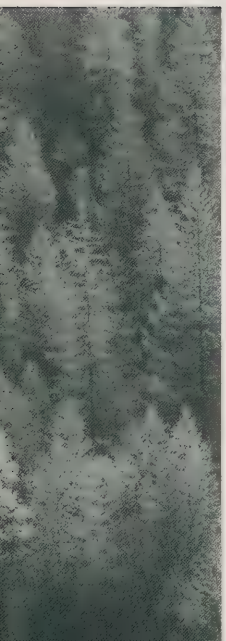
Natural Resources Canada,
http://oee.nrcan.gc.ca
Philip B. Jago, (613) 995-6839,
pjago@nrcan.gc.ca

- The Aluminum Energy Efficiency project includes the replacement of old, less efficient smelters with energy-efficient AP-30 Pechiney technology and the use of committees, working groups, and special studies to pursue other technological advances. Already 70 percent of total aluminum production comes from modern facilities. From 1990-1998, the aluminum sector increased production by 51 percent while reducing its greenhouse gas emissions per unit of production by 41 percent.

  Aluminum Industry Association,
  www.aac.aluminium.gc.ca
  Christian Van Houtte, (514) 288-4842

- The Energy Benchmarking Strategy project provides tools to measure and compare energy performance (usage and costs) in underground bulk mining operations in order to identify where improvements and better practices can be adopted.

  Mining Association of Canada,
  www.mining.ca/english/press/press-eng.html
  Dan Paszkowski, (613) 233-9392, ext. 320;
  dpaszkow@mining.ca



- The Global Climate Change: Taking Action project (completed in September 2000) supported the Pembina Institute's and Stratos's collaboration on the creation of a guide to help managers at all levels in the Canadian mining industry develop a corporate strategic response to the risks and opportunities associated with climate change and greenhouse gas emission reductions. The guide includes the rationale for progressive action on climate change, greenhouse gas emission reduction opportunities, and business opportunities related to greenhouse gas emission reductions that can be implemented in mining operations both within and outside Canada. The guide also includes information on how to inventory, measure and report on climate change actions.

  Mining Association of Canada,
  www.mining.ca/english/press/press-eng.html
  Dan Paszkowski, (613) 233-9392, ext. 320;
  dpaszkow@mining.ca

The Energy Innovators Initiative

This initiative encourages Canadian organizations in the commercial and institutional sectors to make energy-efficiency investments throughout their operations, in order to lower costs and reduce greenhouse gas emissions related to energy use. The program uses partnerships with key associations and corporate energy management planning to guide these organizations to greater energy efficiency. Clients implement their energy-efficiency initiatives with support from the program's information products, advice and incentives.

Natural Resources Canada,
http://oee.nrcan.gc.ca
Gilbert Aubin (public sector), (613) 996-5958,
gaubin@nrcan.gc.ca
David Atkins (private sector), (613) 943-8293,
datkins@nrcan.gc.ca

National Action Plan on Ozone Depleting Substances and their Halo-Carbon Alternatives

Both federal and provincial governments are responsible for control of ozone depleting substances (ODS) and their halo-carbon alternatives (i.e. HFCs and PFCs, substances used in air-conditioning, fire suppression and solvent applications. Regulations controlling the use of ODS are in place in all jurisdictions. In addition Alberta, British Columbia, Newfoundland, Ontario, Yukon and the Government of Canada regulate the

use of HFCs. Other provincial regulations governing HFCs are expected to be implemented in the future.

Environment Canada, www.ec.gc.ca/ozone
Alex Cavadias, (819) 953-1132,
alex.cavadias.ec.gc.ca

Renewable Energy Market Development Program
The Renewable Energy Market Development program encourages the use of renewable energy from emerging resources and helps the supply industry take advantage of promising markets. The program also helps industry improve its delivery infrastructure through a variety of activities, including upgrading industry training programs and product standards, and developing software to facilitate feasibility studies and system designs.

Natural Resources Canada,
www.nrcan.gc.ca/es/erb/reed
Denis Zborowski, (613) 947-9815,
dzborows@nrcan.gc.ca

Voluntary Challenge Registry Inc. (VCR)
This is a not-for-profit corporation that encourages private- and public-sector organizations to voluntarily limit their net greenhouse gas emissions as a step towards meeting Canada's climate change goals. To date, more than 700 companies and organizations from all sectors of the economy have registered action plans, including the Government of Canada and all provincial governments.

Natural Resources Canada, www.vcr-mvr.ca
Marie Maher, (613) 947-2076,
mamaher@nrcan.gc.ca

Alberta

Industry Workshops on International Actions
The Government of Alberta is sponsoring a series of one-day workshops highlighting important developments in international climate change negotiations. These workshops provide Alberta industry with information on how it can benefit and become involved in international projects. The initial focus is on companies already doing business in Latin America. Company and government representatives from Alberta and Latin American countries are invited to a two-day conference to explore opportunities to increase awareness of Clean Development Mechanism (CDM) projects in Latin America.

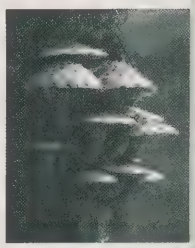
Sarah Waddington, (780) 422-8687,
sarah.waddington@gov.ab.ca

Reductions in Flaring
Following a recommendation by the Clean Air Strategic Alliance (CASA), Alberta's Energy and Utilities Board (EUB) has incorporated in its July 1999 *Flaring Guide* a 25 percent reduction on volumes flared by 2001 and stringent performance standards for the remaining flares. A 25 percent reduction in flaring volumes would reduce CO_2 emissions by an estimated 1.25 megatonnes — a 0.7 percent decrease in Alberta emissions. At the end of 1999, volumes flared were reduced to more than 20 percent below 1996 levels. Alberta's Department of Resource Development and the Energy and Utilities Board, together with stakeholders, have taken actions to facilitate electricity generation from solution gas that would otherwise have been flared. Key priorities have been the creation of a royalty waiver program announced in July 1999 that exempts otherwise flared solution gas from the *Electric Utilities Act.*

www.resdev.gov.ab.ca
Brent Lakeman, (780) 422-8463,
brent.lakeman@gov.ab.ca

Quebec

Promotion of Energy Efficiency
Any project or activity that may help to promote energy efficiency, stimulate the energy-efficiency industry or support the impact made by this industry abroad may be approved for a financial or professional contribution by the Agence de l'efficacité énergétique du Québec. Public and para-public organizations in Quebec, non-profit companies and non-profit organizations are all eligible.



www.aee.gouv.qc.ca/10/150/150-1.htm
Luc Morin, (418) 627-6379

Prince Edward Island

$mart Energy Management
This program assists manufacturers and processors in Prince Edward Island in reducing their energy costs through energy efficiency, mitigating greenhouse gas emissions in the process. The program includes energy efficiency workshops, development and distribution of an interactive CD-ROM on energy efficiency for the sector, and an energy auditing service.

Mike Proud, (902) 368-5019, mpproud@gov.pe.ca

Nova Scotia

Light Better for Less
This program improves lighting efficiency in small commercial operations. Electrical contractors are trained to perform lighting energy audits on small commercial facilities and recommend and install energy-efficient lighting. Wholesalers are asked to increase stock of lighting projects. Seminars and other marketing are directed at small commercial operators.

www.gov.ns.ca/natr/energy/lb4l
Brian Hayes, (902) 424-8162, blhayes@gov.ns.ca

Yukon

Energy Infrastructure Loans for Resource Development Projects (EILRDP) Program
The Energy Infrastructure Loans for Resource Development Projects (EILRDP) Program is designed to encourage the responsible and efficient use of energy in the development of resources in the Yukon. It assists Yukon's resource development sector by deferring the high capital cost of building energy infrastructure.

www.economicdevelopment.yk.ca/
Scott Milton, (867) 667-3061,
scott.milton@gov.yk.ca

BUILDINGS

Government of Canada

Commercial Buildings Incentive Program (CBIP)
This program provides financial incentives to encourage building owners to incorporate energy-efficient technologies and practices in designs for new commercial and institutional buildings.

Natural Resources Canada,
http://oee.nrcan.gc.ca
Jim Clark, (613) 947-1948, jclark@nrcan.gc.ca

EnerGuide for Houses
The EnerGuide for Houses program encourages Canadians to improve the energy performance of their houses. Homeowners receive advice from independent energy-efficiency experts on how to improve home comfort and reduce heating and cooling costs when making home improvements.

Natural Resources Canada,
http://oee.nrcan.gc.ca
Barbara Mullally Pauly, (613) 995-2945,
bmullall@nrcan.gc.ca

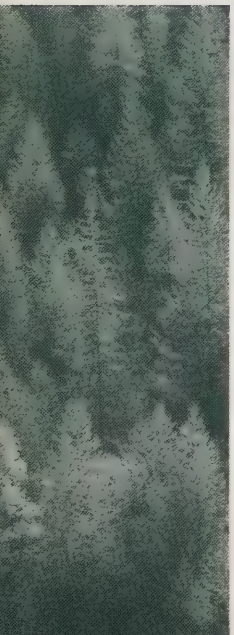
Heating, Ventilation and Air Conditioning (HVAC) Energy-Efficiency Rating System
This program provides consumers with energy-efficiency ratings for gas and propane furnaces, central air conditioning equipment and air-to-air heat pumps. Oil-fired furnaces will soon be added to the rating system. Ratings are published at the back of manufacturers' brochures in order to provide consumers with the information needed to purchase energy-efficient home heating and air conditioning products. This program is operated in association with the Heating, Refrigeration and Air Conditioning Institute (HRAI), which provides contractors with the tools to promote the sale of more energy-efficient equipment.

Natural Resources Canada,
http://oee.nrcan.gc.ca
Anne Wilkins, (613) 992-3900,
awilkins@nrcan.gc.ca

Model National Energy Code for Buildings and Houses
This program aims to increase the energy efficiency of new Canadian houses and buildings by specifying minimum energy requirements, supporting the implementation and adoption of these model national energy codes by relevant authorities having jurisdiction for buildings and houses, and monitoring and analyzing the impact of such codes.

Natural Resources Canada,
http://oee.nrcan.gc.ca
John Cockburn (Buildings), (613) 996-4359,
jcockbur@nrcan.gc.ca
Barbara Mullally Pauly (Houses), (613) 995-2945,
bmullall@nrcan.gc.ca

R-2000 HOME
The R-2000 HOME program uses a quality-assurance process to ensure that certified R-2000 houses meet the voluntary performance standard for energy efficiency, indoor air quality and environmental sustainability. The program is delivered provincially and in the Territories by more than 30 industry partners, including energy utilities and home builders' associations. The program's quality assurance process provides technical support, builder training and industry infrastructure. Between 1982 and1995, the program was responsible for reducing the equivalent of 14,200 kilotonnes of CO_2.



The R-2000 HOME program has had a major influence on building codes and energy-efficient technologies and practices in new home construction. Since the program began in 1982, more than 8,000 homes have been R-2000-certified and more than 10,000 builders have received R-2000 training.

Natural Resources Canada,
http://oee.nrcan.gc.ca
Tim Mayo, (613) 996-0777, tmayo@nrcan.gc.ca

Renewable Energy Deployment Initiative (REDI)
This program promotes renewable energy systems for space and water heating, and for cooling through an incentive that funds 25 percent of the cost of adopting new systems (to a maximum of $50,000). Eligible systems include solar air heating, solar water heating, high efficiency/low emission biomass combustion. REDI also provides market support for earth energy systems and supports pilot projects in the public institutions and residential markets.

Natural Resources Canada,
www.nrcan.gc.ca/es/erb/reed
Celia Kirlew, (613) 943-2215,
ckirlew@nrcan.gc.ca

Sponsorship Program
The Sponsorship Program provides Canadian homeowners with consumer information on residential energy efficiency through a network of sponsors that includes hardware and building supply retail sectors, utilities, media and industry associations.

Natural Resources Canada,
http://oee.nrcan.gc.ca
Mary O'Keefe, (613) 947-1203,
mokeefe@nrcan.gc.ca

British Columbia

Green Buildings B.C.
This initiative has two parts:

- The **Retrofit Program** provides an opportunity for provincially-funded schools, universities, colleges, and health care institutions to upgrade existing facilities with energy and water efficiency enhancements, as well as waste-saving measures. Since the late 1970s, British Columbia has reduced energy consumption in targeted buildings by more than 55 percent and generated more than $120 million in total energy savings.

  www.greenbuildingsbc.com
  Orest Maslany, (250) 952-8631,
  omaslany@bcbc.bc.ca
  www.bcbc.bc.ca
  Jack Meredith, (250) 952-8627,
  jmeredith@bcbc.bc.ca

- The **New Buildings Program**: New provincially-funded facilities will meet or exceed national energy-efficiency standards, within existing capital budgets. In addition, the program is working with industry to promote BC expertise in "green" building design, construction and operation.

  www.greenbuildingsbc.com
  Martine Desbois, (250) 952-0668,
  Martine.Desbois@gems2.gov.bc.ca

Tax Exemption for Energy Conservation Materials and Equipment
A provincial sales tax exemption is provided for certain energy conservation materials and equipment, including insulation materials for buildings (e.g. various types of insulation material, double-paned windows, doors) and certain wind, solar and micro-hydro equipment.

Ministry of Finance and Corporate Relations
www.fin.gov.bc.ca/revenue/ctb/MoreTopics.htm
(See Bulletin 11)
Glen Armstrong, (250) 387-4196,
glen.armstrong@gems2.gov.bc.ca

Alberta

School Buildings Guidelines
The Alberta Government has created new standards and guidelines for the building of new schools and the modernization of existing ones. The purpose is to provide a minimum standard for this work. These guidelines incorporate life cycle costing and energy efficiency requirements. They also require that decisions be made on a ten-year payback.

John Gibson, (780) 422-0106,
john.gibson@gov.ab.ca

Saskatchewan

EnerGuide for Houses
The Government of Canada's EnerGuide for Houses program is delivered in Saskatchewan by Sun Ridge Group. Its objective is to further improve the energy efficiency and reduce the environmental impact of Canadian low-rise housing. EnerGuide for Houses

evaluates the energy-related features of a house, estimates the home's annual energy requirements and provides a comparative energy-efficiency rating.

www.gov.sk.ca/enermine
Howard Loseth, (306) 787-3379,
howard.loseth@sem.gov.sk.ca

Energy Management Initiative
This initiative makes affordable improvements to health facilities to obtain optimum energy efficiency and cost benefits.

Leslie Parker, (306) 787-3265,
lparker@health.gov.sk.ca

Northern Energy Efficiency Feasibility Study
Through this study, Saskatchewan Environment and Resource Management (SERM) is assessing the potential for pilot projects for improving the energy efficiency of public buildings in Northern Saskatchewan communities.

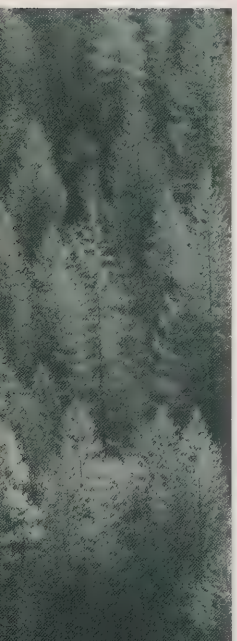
Ron Zukowsky, (306) 787-6285,
ron.zukowsky.erm@govmail.gov.sk.ca

R-2000 HOME
The Government of Canada's R-2000 HOME program is implemented in Saskatchewan by the Saskatchewan Homebuilders' Association. Its goals are to promote energy-efficient housing in Saskatchewan and to provide the framework and procedures whereby builders may construct houses to the R-2000 standard and whereby the houses may receive a national R-2000 identification certificate. In 1999-2000 there were 13 R-2000 homes built and certified, and there were 15 active R-2000 builders.

www.gov.sk.ca/enermine
Howard Loseth, (306) 787-3379,
howard.loseth@sem.gov.sk.ca

Residential Rehabilitation Assistance Program (RRAP)
The RRAP Program includes several repair programs that benefit low-income homeowners and renters by bringing their homes up to minimum health and safety standards and improving energy efficiency. Also included is a program to encourage landlords to convert appropriate non-residential buildings to residential uses.

www.mach.gov.sk.ca
Linda MacNaughton, (306) 787-7367,
lmacnaughton@mach.gov.sk.ca



Quebec

Energy Efficiency Action Program in the Institutional Sector
The program of the Agence de l'efficacité énergétique du Québec provides financial support to encourage institutions to promote energy efficiency. This assistance is intended for institutions that conduct energy analyses and feasibility studies that lead to the implementation of measures or projects designed to reduce energy bills by 10 percent.

Agence de l'efficacité énergétique du Québec (AEE) www.aee.gouv.qc.ca/10/150/150-3.htm
Jean-Marc Robert, (418) 627-6379

NOVOCLIMAT Program
The goal of this program of the Agence de l'efficacité énergétique du Québec (AEÉ) [Quebec energy efficiency agency] is to support initiatives designed to improve the energy performance of new houses by training and accrediting persons involved in the residential construction sector. The program will make it possible to develop a product and skills that will benefit consumers.

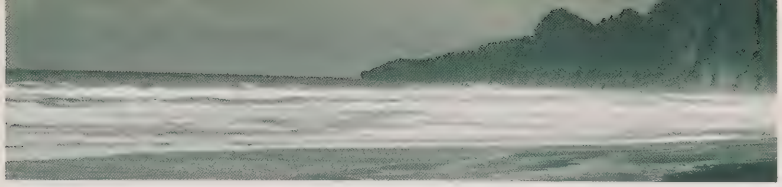
Agence de l'efficacité énergétique du Québec (AEE), www.aee.gouv.qc.ca
Chantal Dallaire, (418) 627-6379

Rules Governing Energy Performance Contracts
The Quebec Department of Education has prevailed upon the government to amend the regulations governing construction contracts to allow all parts of the education system to award contracts designed to achieve savings as a result of energy improvements to buildings. These contracts are paid for with the savings achieved and include both professional services and construction work.

Quebec Department of Education
www.meq.gouv.qc.ca
Jean Drouin, (418) 644-2525

New Brunswick

Energy Efficient Standards for Buildings
The objective of this program is to increase the level of energy efficiency in new facilities by promoting the use of energy efficiency standards for buildings. A variety of activities are undertaken to support this effort. New Brunswick is a member of the Canadian Consortium for Building Energy Compliance Software



who have released a software package that measures compliance under the Model National Energy Code for Buildings. The province also supports R-2000 and requires that social housing be built to the R-2000 standard. The penetration of R-2000 homes in New Brunswick has had a significant impact on the standard levels of energy efficiency in new homes, which are close to the R-2000 standard.

Rob Murray, (506) 453-2206, rob.murray@gnb.ca

Nova Scotia

Halifax Home Tune-Up Program
The goal of this two-year program is to improve energy efficiency, conserve water, and improve waste management practices and air quality in two thousand homes in the greater Halifax area, by providing low-cost, in-house environmental assessments. Homeowners receive written reports including recommendations for improvements, an information package, a water conservation kit, and a list of long-term retrofits requiring contractor assistance.

www.clean.ns.ca/programs/tuneup.html
Peter Geddes, (902) 420-3474,
pgeddes@clean.ns.ca

Residential Energy Advisory Service
This program encourages the use of energy-efficiency measures and renewable energy in new home construction and renovation. Activities are directed at contractors and homeowners. The program includes support for the Government of Canada's R-2000 HOME program, EnviroHome projects, energy-efficient and renewable energy demonstration projects, publications and videotapes on energy efficiency.

www.gov.ns.ca/natr/energy
George Foote, (902) 424-8168, gffoote@gov.ns.ca

Yukon

C-2000
C-2000 is delivered by the Yukon Housing Corporation. Its objective is to encourage increased energy efficiency and environmental performance in commercial buildings through enhanced awareness and understanding among building owners and through training courses for building designers and construction contractors.

Ed Zanetti, (867) 667-8696, ed.zanetti@gov.yk.ca

Commercial Energy Management Program
This program assists municipalities, First Nations, and private building owners and tenants to implement energy-efficient renovations, including lighting retrofits and heating system improvements. The program also provides energy audits, general information, and financial incentives.

Ed Zanetti, (867) 667-8696, ed.zanetti@gov.yk.ca

EnerGuide for Houses
EnerGuide for Houses is a Government of Canada program delivered in the Yukon by the Yukon Housing Corporation. It provides site visits by energy auditors who test the home to determine its energy rating and consult with occupants on suggested improvements. The Yukon Housing Corporation provides low-interest financing to help carry out the energy auditor's recommendations. See Home Repair Program, Green Mortgages, and Residential Electricity Management Program.

Ed Zanetti, (867) 667-8696, ed.zanetti@gov.yk.ca

Energy Efficiency Initiative
This initiative promotes the efficient use of energy in the home and in the workplace by providing information to homeowners and businesses. A pilot (House Calls) project involving visits to over 100 homes has been completed. Demonstrations of energy-saving options for businesses are being conducted. In winter 2000-01 House Calls will visit 2,000 homes. Estimated greenhouse gas reduction is 1,000 tonnes.

www.yec.yk.ca/
Duncan Sinclair, (867) 393-5334,
duncan.sinclair@yec.yk.ca

Green Mortgages
This program encourages energy-efficient construction and the use of local labour and building materials through preferred mortgage rates. Homes must meet a strict energy budget.

Ed Zanetti, (867) 667-8696, ed.zanetti@gov.yk.ca

Home Repair Program
This program is intended to upgrade Yukon homes to current building code standards of safety and comfort. As part of this, it also addresses energy efficiency.

Ed Zanetti, (867) 667-8696, ed.zanetti@gov.yk.ca

R-2000 HOME
R-2000 promotes comfortable, healthy, low-maintenance, energy-efficient housing through training, builder registration and certification, performance standards, inspection, testing, research and development, and information.

Ed Zanetti, (867) 667-8696, ed.zanetti@gov.yk.ca

Rental Rehabilitation Program
This program provides low-interest loans to landlords to improve the energy efficiency of rental units.

Ed Zanetti, (867) 667-8696, ed.zanetti@gov.yk.ca

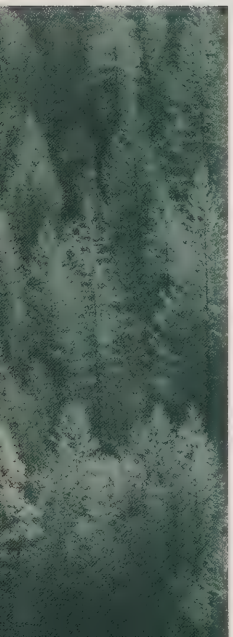
Residential Electricity Management Program
This program is sponsored by the Yukon Development Corporation and administered by the Yukon Housing Corporation. It provides low-interest loans to replace electric heat in residences with alternative heating systems. It has resulted in more than 200 conversions since 1997, with an annual reduction of 2,500 tonnes of CO_2.

Ed Zanetti, (867) 667-8696, ed.zanetti@gov.yk.ca

Northwest Territories

Inuvik Conversion Assistance Program
This program provides financial assistance to residential homeowners to convert from oil heat to natural gas. The amount of the grant is matched by the gas supplier. The major objective of the program is to assist in the rapid conversion of residential homeowners to a local, cleaner energy source for heating.

www.ngasnwt.com/
Jill Finley, (867) 777-7055, jfinley@inuvikgas.com



AGRICULTURE

Government of Canada

Agricultural Environmental Stewardship Initiative (AESI)
The Agricultural Environmental Stewardship Initiative (AESI), funded under the Canadian Adaptation and Rural Development (CARD) fund, addresses the regional impacts of agricultural practices on water, soil, and air quality, biodiversity and greenhouse gas emissions through education and awareness, technology transfer, and stewardship tools including environmental clubs, environmental management systems, and land use planning. This program is delivered through the provincial and territorial adaptation councils.

Agriculture and Agri-Food Canada,
http://agr.ca/policy/environment/home.html
John Brown, (613) 759-7301, brownj@em.agr.ca

Community Pasture Program
The Prairie Farm Rehabilitation Administration operates over 900,000 hectares of community pasture in the three prairie provinces. The two major objectives of the program are to remove lands from unsuitable or unacceptable land uses and to facilitate improved land use through their rehabilitation, conservation and management; and to utilize the resource primarily for the summer grazing of cattle while assisting in stabilizing small farms and providing breeding bulls to encourage high quality, long-term cattle production. Grazing management and stocking rates significantly increase carbon sequestration in soils and reduce methane emissions. Pasture patrons, mainly cattle ranchers, pay full cost recovery for the service provided.

Prairie Farm Rehabilitation Administration (PFRA), www.agr.ca/pfra/cpproge.htm
www.agr.ca/pfra/resource/climate.htm
Hugh Cook, (306) 780-5158, cookh@em.agr.ca
Rick Gaube, (306) 780-5154, gauber@em.agr.ca

Irrigation and Water Management Technology Transfer
The irrigation and diversification centres at Outlook, Saskatchewan and Carberry, Manitoba demonstrate irrigation and water management technologies that improve the efficiency of agricultural production and reduce the emission of greenhouse gases.

Prairie Farm Rehabilitation Administration (PFRA), www.agr.ca/pfra/mcdcgene.htm and
www.agr.ca/pfra/sidcgene.htm
www.agr.ca/pfra/resource/climate.htm
Laurie Tollefson, (306) 867-5404,
tollefsonl@em.agr.caq
Dale Tomasiewicz, (204) 834-6005,
tomasiewiczd@em.agr.ca

Livestock Environmental Initiative (LEI)
This $1.3 million initiative under the Canadian Adaptation and Rural Development (CARD) program is comprised of two components: research and development, assessment and transfer of technology to the livestock industry; and the development of a national environmental certification system for the hog industry. Many of the mitigation measures that would address the environmental priorities of the livestock

sector will also assist in the reduction of greenhouse gas emissions. Greenhouse gas emissions is one of the criteria used in the screening of research proposals.

Agriculture and Agri-Food Canada
www.agr.ca/policy/environment/home.html
Sheila Jones (613) 759-7300, jonessh@em.agr.ca

Permanent Cover Program (PCP)

The PCP programs (PCP I and PCP II) converted land marginal for annual cultivation in cereal production to long-term forages in order to reduce soil degradation on environmentally sensitive lands that have high erosion risk under annual cultivation. Local landowners made either 10 or 21 year commitments to perennial cover on these lands. The PCP, announced in 1989, took place in Manitoba, Saskatchewan and parts of Alberta. PCP II (1991) included eligible land in the Peace River Region of British Columbia and in Alberta. Studies have shown significant carbon sequestration potential in the lands that have been converted.

Prairie Farm Rehabilitation Administration,
www.agr.ca/pfra/land/margine.htm
www.agr.ca/pfra/resource/climate.htm
Ken Thompson, (306) 780-5159,
thompsonk@em.agr.ca

Shelterbelt Program

The Shelterbelt Program is a permanent program for the distribution of seedlings, free of charge, to farmers and Conservation Boards for planting shelterbelts or for conservation and land reclamation projects in the Prairies. It includes a research and a communications component. Some program results include the creation of wildlife habitat, conservation of soil, carbon sequestration, and significant energy reductions in farmsteads. The applicants are responsible for transportation costs, and to plant and maintain the shelterbelts.

Prairie Farm Rehabilitation Administration,
www.agr.ca/pfra/shbproe.htm
www.agr.ca/pfra/resource/climate.htm
Bruce Neill, (306) 695-2284, neillb@em.agr.ca

Soil Management, Manure Management and Resource Planning Activities

The Prairie Farm Rehabilitation Administration (PFRA) offers soil and manure management advice to clients on topics such as tillage, summerfallow, cropping, intensive livestock siting, riparian area management, resource conservation and development issues. Examples that relate to climate change include:

- **Straw Harvest Potentials** – to assess the potential for the sustainable harvest of crop aftermath for use in straw board and other emerging manufacturing industries.
- **Prairie Agriculture Landscapes Project** – to assess the impact on the soil resources of future economic development and climate scenarios.
- **Methane and Nitrous Oxide** – demonstration of manure management techniques such as lagoon covers.

Prairie Farm Rehabilitation Administration,
www.agr.ca/pfra/resource/sconsere.htm
www.agr.ca/pfra/pfintroe.htm
www.agr.ca/pfra/resource/climate.htm
Bob Wettlaufer, (306) 780-5105,
wettlauferb@em.agr.ca
Bernie Ward, (306) 780-8132, wardb@em.agr.ca

Alberta

Environmentally Sustainable Agriculture Program

The Alberta Environmentally Sustainable Agriculture Program is helping to develop and encourage farming practices that can lead to lower greenhouse gas emissions. More than 25 projects are underway in the program's four components: farm-based, processing-based, resource monitoring, and research. It has encouraged research and adoption of reduced tillage and other management practices that have reduced fuel use and increased soil carbon storage. The program also supports research to find cost-effective ways to reduce greenhouse gas emissions from agriculture and agri-food business.

Alberta Agriculture, Food and Rural Development, www.agric.gov.ab.ca
John Hermans, (780) 427-3908,
john.hermans@gov.ab.ca

Farm Business Management Program

This program focuses primarily on improving financial and other business management skills. Production (nutrient) management is one component of the program that can provide greenhouse gas reduction benefits.

Alberta Agriculture, Food and Rural Development, www.agric.gov.ab.ca
Wilson Loree, (403) 556-4213,
wilson.loree@gov.ab.ca

Proposed Regulatory Framework for Livestock Feeding Operations in Alberta
One component of this proposed framework for Alberta is a standards document to deal with manure storage and nutrient management. This is a way to identify and encourage adoption of practices and technologies to reduce greenhouse gas emissions.

Alberta Agriculture, Food and Rural Development, www.agric.gov.ab.ca
Joe Rosario, (780) 422-2070,
joe.rosario@gov.ab.ca

Saskatchewan

Crop Nutrient Management
This program focuses on the extension/promotion/technology transfer/R&D of soil fertility management practices/cropping systems for major and diversified crops to maximize nutrient use efficiency while sustainability and improving the health of our soils. Soil and plant tissue testing are major tools in achieving this objective. R&D projects have components dealing with greenhouse gases, including the form, timing, and placement of fertilizers, with a focus on nitrogen.

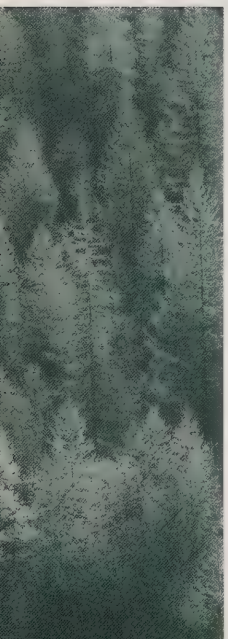
www.agr.gov.sk.ca
Ken Panchuk, (306) 787-0556,
kpanchuk@agr.gov.sk.ca

Crop Residue Burning Program
The Residue Burning Pilot is being expanded to increase farmer awareness and to provide information to farmers, with the objective of encouraging farmers to reduce or stop crop residue burning.

www.agr.gov.sk.ca/
Wayne Gosselin, (306) 787-6586,
wgosselin@agr.gov.sk.ca

Improved Grazing Management
This program seeks to improve and sustain rangeland and pasture resources through continued research and the provision of technical advice and training to producers involved in range/livestock production. It also encourages multiple use of rangeland and environmental sustainability.

www.agr.gov.sk.ca
Zoheir Abouguendia, (306) 651-4182,
zabouguendia@agr.gov.sk.ca,



Manure Management
The focus of this program is on managing manure as a resource. When used properly, manure can be a valuable source of plant nutrients and organic matter to improve crop production and soil quality. Manure is a source of soil organic matter (sequestered carbon).

www.agr.gov.sk.ca/
Karen Bolton, (306) 787-9183,
kbolton@agr.gov.sk.ca

Processing of Surplus Crop Residues
This program encourages processing of surplus crop residues to produce value-added products such as fibre products, strawboard, and alternate energy products.

www.agr.gov.sk.ca
Ken Panchuk, (306) 787-0556,
kpanchuk@agr.gov.sk.ca

Pulse and Other Legume Production
Pulse and legume crop diversification assists in achieving sustainability. Pulses and other legumes fix nitrogen from the air, reducing the need for nitrogen fertilizer, and encourage local value-added processing. They also encourage longer rotations and reduction in summerfallow acres.

www.agr.gov.sk.ca
Ken Panchuk, (306) 787-0556,
kpanchuk@agr.gov.sk.ca

Soil Conservation
Soil conservation projects (extension, awareness, R&D) have the objective of adjusting agricultural practices to reduce the loss and enhance the productivity of valuable top soil. As a result, these projects increase the uptake or reduce the production of greenhouse gases. Building soil organic matter (carbon sequestration) and reducing soil erosion are the two main focuses. Practices include reduced tillage, zero-till, field shelterbelts, grass strips, strip cropping, etc.

www.agr.gov.sk.ca
Ken Panchuk, (306) 787-0556,
kpanchuk@agr.gov.sk.ca

Prince Edward Island

Agriculture and Environmental Resource Conservation (AERC)
The program provides technical and financial assistance to farmers to make their farm operations more

productive and sustainable, while achieving compliance with environmental protection legislation. A wide range of on-farm conservation projects are eligible, including soil erosion control practices, soil conservation, hedgerow planting, manure storage, livestock fencing and watering.

www.gov.pe.ca/af/aerc/index.asp
Patsy Reardon, (902) 894-0340

Capture and Use of Methane Gas at Agri-food Processing Plants

This program promotes the capture of methane for use as a replacement for heavy fuel oil. Methane capture in 1999 was approximately 4 million cubic metres, which replaced 800,000 gallons of Bunker "C" oil.

Todd Fraser, (902) 368-5037, ktfraser@gov.pe.ca

Land Use Inventory Field Plots

This program establishes soil quality indicators, measures soil quality on an ongoing basis using a variety of parameters, and reports results to the public. The inventory includes 254 forested locations with an average of 3.4 plots per cluster and 232 agriculture locations that also had an average of 3.4 plots per cluster. One of the measurements that will be monitored is total organic carbon in the soil.

Teresa Mellish (Agriculture), (902) 368-5605
Bill Glen (Forestry), (902) 368-4703

Livestock Management and Grazing Management

The objectives of this program are to reduce emissions from digestive processes and manure storage and application and to increase nutritional quality of pasture grasses. The focus will continue to be on fencing and watering options to prevent livestock access to watercourses and to prevent water contamination by manure.

Christine MacKinnon, (902) 368-6776,
cgmackinnon@gov.pe.ca

Planting Hedgerows and Shelter Belts

This program promotes the planting of hedgerows and shelter belts to mitigate soil erosion by wind and to sequester carbon.

Soil Nutrient Efficiency

This program develops and promotes best management practices that result in farmers applying the appropriate form, amount, timing and concentration of nitrogen, such as broader adoption of nutrient management planning.

Christine MacKinnon, (902) 368-6776,
cgmackinnon@gov.pe.ca

Nova Scotia

Annapolis Atmosfarm Project

The purpose of the project is to increase understanding of climate change, reduce greenhouse gas emissions and increase carbon sequestration on commercial farms in the Annapolis Valley region. The project will develop and publish a farmers' handbook that will promote a list of actions that farmers can take now to reduce greenhouse gas emissions and increase carbon uptake in the soil. In addition, the project will identify longer-term measures that the agricultural industry can take to reflect the emerging realities of climate change. It is anticipated that at least 30 percent of the 1,140 farms in the Annapolis Valley will voluntarily adopt the protocols of the Atmosfarm Plan. Ultimately, all Canadian farmers may use these same protocols.

Renée Després, (902) 532-7533,
r_despres@hotmail.com
Scott McCoombs, (902) 4524-7305,
srmccoom@gov.ns.ca

FORESTRY (SINKS)

British Columbia

Forests – Carbon Budget Modelling

Using the Government of Canada's national carbon emissions model, British Columbia is analyzing carbon emissions for tree farm licences and timber supply areas under combinations of potential accounting rule scenarios. This will clarify BC's sink/source position under various potential Kyoto outcomes.

Ian Whitworth, (250) 387-8692,
ian.whitworth@gems2.gov.bc.ca

Forests – Research and Modelling Towards Developing a Carbon Management Accounting Framework for BC

British Columbia is developing a carbon management accounting framework for forests that focuses on four key areas: developing standards for carbon measuring, reporting and monitoring for the province with links to national standards; investigating the development of a

carbon information system, enabling forest companies to submit operational data for automatic processing/reporting; researching soil carbon storage to develop regionally specific conversion factors relating merchantable volume to estimates of soil carbon storage; and investigating legislative changes required to establish non-timber rights to sequestration credits as an incentive to forest carbon sink projects.

Ian Whitworth, (250) 387-8692,
ian.whitworth@gems2.gov.bc.ca

MUNICIPALITIES

Government of Canada

Community Energy Systems

The Community Energy Systems program helps Canadian communities meet their energy needs by identifying and developing opportunities for the use of district heating and cooling, combined heat and power (cogeneration), waste heat recovery, thermal storage and local sources of renewable energy, particularly biomass.

Natural Resources Canada,
www.nrcan.gc.ca/es/etb/cetc/cetchome.htm
Michael Wiggin, (613) 996-8870,
mwiggin@nrcan.gc.ca

Partners for Climate Protection (PCP)

This program is a partnership between the Federation of Canadian Municipalities (FCM) and the International Council for Local Environmental Initiatives (ICLEI), supported by the Government of Canada, that helps municipal governments reduce greenhouse gas emissions. The central focus of PCP is community sustainability. Current priorities for PCP are: engagement (identifying champions, assessing needs, developing templates for local action plans), capacity-building (an on-site employment program, a newsletter, greenhouse gas software and a national workshop); and the Sustainable Community Awards Program (annual awards to six municipalities that have excelled in planning and implementing innovative approaches to sustainable community development).

Federation of Canadian Municipalities,
www.fcm.ca
Azzah Jeena, (613) 241-5221 ext. 264,
ajeena@fcm.ca

British Columbia

Energy Aware Committee (EAC)

The EAC works with interested local governments to promote and support Community Energy Planning (CEP). Over the last two years, the committee has conducted CEP workshops for local governments in the Greater Vancouver Regional District (GVRD), the Central Okanagan, the Capital Regional District and the City of Abbotsford. These workshops help communities examine the energy-efficiency opportunities presented through CEP, and identify opportunities to implement energy efficiency initiatives.

www.energyaware.bc.ca
Odette Brassard, (604) 270-8226,
obrasar@energyaware.bc.ca

Partners for Climate Protection (PCP)

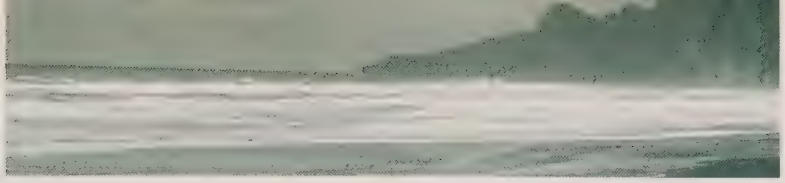
Several British Columbia municipalities are involved in the Partners for Climate Protection program led by the Federation of Canadian Municipalities. The Greater Vancouver Regional District (GVRD), its member municipalities and neighbouring regional and local governments are actively involved in the GVRD Regional and Local Government Working Group on Climate Change (WGCC) to share information and expertise on implementation of greenhouse gas reduction initiatives. The GVRD is also actively involved in several greenhouse gas initiatives through its Air 2000 program, including high volume flash concrete, solar thermal pool retrofits, better building partnerships and greenhouse gas action guide.

www.gvrd.bc.ca
Jennie Moore, (604) 451-6683,
jennie.moore@gvrd.bc.ca

Alberta

Eco-Efficient Communities Initiative

The Alberta Eco-Efficient Communities Initiative, developed by Alberta's Clean Air Strategic Alliance (CASA), provides municipalities with the practical information and tools to reduce operational costs, create local jobs and reduce greenhouse gas emissions. The program is designed for small and mid-sized communities in Alberta, which often do not have the in-house staff and resources for independent energy efficiency exploration. The program, delivered by the Pembina Institute, offers a range of project materials,



workshops and conferences that are available to any local government interested in doing more with less.

www.pembina.org
Brent Lakeman, (780) 422-8463,
brent.lakeman@gov.ab.ca

Kikino Métis Settlement Pilot Initiative
Kikino Métis Settlement in northeastern Alberta is the focus of a pilot project to identify greenhouse gas reduction opportunities and encourage action. The Alberta government and partners including the Kikino Métis Settlement, TransCanada, Alberta Pacific Forest Industries Ltd., and the Government of Canada are working together to help shape future community engagement initiatives in other Alberta communities.

Brent Lakeman, (780) 422-8463,
brent.lakeman@gov.ab.ca

Natural Gas Service Extended to Three Métis Settlements
Under the Rural Gas Grant Program, natural gas service was extended to three Métis settlements in northern Alberta, Buffalo Lake, Kikino, and Gift Lake Métis settlements. The Rural Gas Grant Program is a cost-sharing mechanism that defrays the costs of installing natural gas infrastructure in rural Alberta.

Terry Holmes, (780) 427-0134,
terry.holmes@gov.ab.ca

Sustainable Communities Initiative (SCI)
Alberta Environment and FEESA, an Environmental Education Society, are working through the Sustainable Communities Initiative to support local community efforts to achieve their visions of sustainability. SCI has helped communities develop and implement action plans on waste, green spaces, transportation, sustainable housing and other grassroots projects. The program has been implemented in eight communities across Alberta.

www.feesa.ab.ca
Bev Yee, (780) 427-5025, bev.yee@gov.ab.ca

New Brunswick

Partnership Initiatives
The objective is to encourage voluntary action by actively supporting the delivery of energy efficiency programs through partnership arrangements. Examples include in kind support to the New Brunswick Lung Association in the delivery of the Wood Stove Campaign and Healthy Schools Program and the R-2000 program, which is delivered by the New Brunswick Home Builders Association.

Rob Murray, (506) 453-2206, rob.murray@gnb.ca

Prince Edward Island

Waste Watch
The Island Waste Management Corporation (IWMC – a provincial crown corporation) is responsible for the management of all solid waste on Prince Edward Island, including the implementation of the Waste Watch Program. Waste Watch, which is currently running in selected areas of the province, is a three-stream source separation system that includes recycling, compost and waste. Currently, 10,000 tonnes of organic matter are diverted from landfill annually. The IWMC anticipates that by 2002, the Waste Watch program will be operational Island-wide and that 30,000 tonnes of organic material will be diverted from landfill per year and composted. The quantities of methane and carbon dioxide produced in composting are far less than those produced by the same quantity of organics in a landfill situation.

Todd Fraser, (902) 368-5037, ktfraser@gov.pe.ca

Yukon

Community Development Fund (CDF)
This program assists municipal and First Nations governments and community non-profit organizations to implement projects to improve the quality of community life. A wide range of projects is eligible for funding. Energy-related projects funded under CDF include wind energy monitoring, solar power for a summer camp, an educational wind turbine for a school, a wood-fired district energy system, and a series of workshops to increase energy efficiency in recreation facilities.

www.economicdevelopment.yk.ca/
programs_and_services/community_
development_fund.asp
Cheryl Goulet, (867) 667-3561,
cheryl.goulet@gov.yk.ca

Community District Energy
This program assists municipal and First Nations governments to implement district energy projects to utilize residual heat from community diesel power plants. One installation is completed at Watson Lake,

heating the school and community centre, with possible expansion to privately owned buildings. This installation reduces greenhouse gas production by up to 800 tonnes of CO_2 per year. Studies are being conducted to identify potential projects in other communities.

www.gov.yk.ca/depts/dgs/Govserv.htm
Pat Hogan, pat.hogan@gov.yk.ca, (867) 667-3064

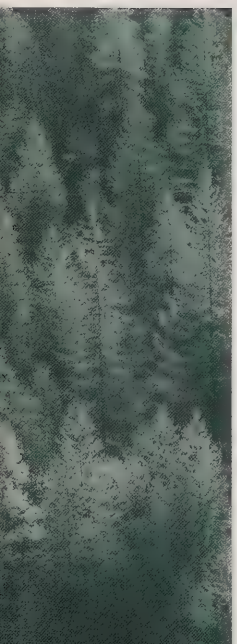
Rural Electrification Program
This program is available to Yukon residents in areas not serviced by utility power. It encourages the installation of renewable alternative energy systems through information and low-interest loans.

www.yukon.net/cts/property.html
Clare Robson, (867) 667-5268,
clare.robson@gov.yk.ca

Nunavut

Energy Management
The energy management program in Nunavut promotes energy management and community energy planning with local government, Nunavut regional staff and other decision-makers; raises awareness of the Arctic Energy Alliance (AEA) and its program; performs energy assessments of major buildings and facilities; and determines the potential for energy management projects that would ensure benefits to the community. The initiative is currently active in nine communities.

Earle Baddaloo, (867) 975 5910,
ebaddaloo@gov.nu.ca



CROSS-SECTOR INITIATIVES

Government of Canada

Climate Change and Health Office
Health Canada established the Climate Change and Health Office in 1998 as the department's point of entry for all intra- and inter-departmental climate change-related issues. A team of five provides support for various climate change-related inter-departmental committees and for horizontal file management and linkages to other departmental branches. Its mission is to ensure that the potential impacts of climate change on human health are evaluated and to propose solutions to address the health impacts of climate change. It also ensures that Government of Canada actions intended to mitigate and to adapt to global climate change take into consideration the implications of climate change on human health and address potential health impacts.

Health Canada, www.hc-sc.gc.ca/english/climate.htm
Mark Raizenne, (613) 954-0161,
mark_riaizenne@hc-sc.gc.ca

Alberta

Climate Change Central
Climate Change Central was announced in November 1999 as a public/private partnership to implement the key recommendations of the Alberta Climate Change Round Table. Climate Change Central is a catalyst for governments, municipalities, businesses, institutions, non-governmental organizations and individuals to focus on climate change strategy, education and capacity building, and technology. Premier Ralph Klein is the executive chair of Climate Change Central. The Alberta Environment Minister and David Tuer, President and CEO of PanCanadian Petroleum Limited, are the co-chairs. Thirteen business and community leaders bring a broad range of expertise to the board of Climate Change Central, which also includes representatives from the environmental and academic communities, municipalities and industries involved in climate change.

www.climatechange.gov.ab.ca
Raymond Stemp, (780) 427-2303,
raymond.stemp@gov.ab.ca

Canada's commitment to the development and adoption of new technologies and innovations has positioned us as a key player in today's global economy. Governments throughout Canada are supporting the development and dissemination of the technologies that will help us, and others around the world, reduce greenhouse gas emissions.

Promoting Technology Development and Innovation

TRANSPORTATION

Government of Canada

Emissions Research and Measurement Division
The Emissions Research and Measurement Division provides support to a number of industry/government programs directed at the development of new technologies for reducing greenhouse gas emissions from the transportation sector. Activities include the characterization of emissions for gasoline and diesel engines, hybrid vehicles, fuel conversion systems, fuel cells and related equipment.

Environment Canada, www.ec.gc.ca
Fred Hendren, (613) 990-5859,
fred.hendren@ec.gc.ca

Transportation Energy Technologies Program (TETP)
This program supports Canadian industry's development and deployment of technologies and fuels that provide a cleaner, more sustainable energy mix for our roadways. Key activities include the development of electric vehicles and hybrids, fuel cells, and alternative transportation fuels like natural gas, propane, ethanol, methanol and hydrogen.

Natural Resources Canada,
www.nrcan.gc.ca/es/etb/cetc/cetchome.htm
Nick Beck, (613) 996-6022, nbeck@nrcan.gc.ca

British Columbia

Ethanol Development Program
British Columbia has provided $300,000 to initiate a provincial Ethanol Development Program (EDP) to develop commercially viable technologies that will produce fuel ethanol from softwood residue. The EDP is a collaboration among forest companies, the Canadian Petroleum Producers Institute, and governments.

www.elp.gov.bc.ca
Liz Lilly, (250) 387-4772,
liz.lilly@gems3.gov.bc.ca

ENERGY USE AND PRODUCTION

Government of Canada

Advanced Materials

Advanced Materials Technologies Program
The Advanced Materials Technologies Program conducts research into innovative materials and processes that respond to environmental requirements and concerns, and contribute to climate change mitigation. Research areas include lightweight materials for transportation, fuel cells, sensors and actuators, hydroforming of aluminum and steels, and advanced metallic powders for rechargeable batteries.

Natural Resources Canada,
www.nrcan.gc.ca/mms/canmet-mtb/mtl/ENG/advdmat.htm
Jason Lo, (613) 992-2699, jlo@nrcan.gc.ca

Canadian Lightweight Materials Research Initiative
The Canadian Lightweight Materials Research Initiative (CLiMRI) is an industry-lead program for developing light and high-strength materials for conventional and advanced vehicles. (e.g. powered by fuel cells and batteries, and hybrids). Issues addressed are alloy design, thermomechanical processing, and manufacturing involving Mg, Al, high-strength steel, metal matrix composites, plastics and polymer-based composites.

Natural Resources Canada,
http://climri.nrcan.gc.ca/
Jennifer Jackman, (613) 995-8248,
jjackman@nrcan.gc.ca

Clean Combustion Technologies

Advanced Combustion Technologies Laboratory
The Advanced Combustion Technologies Laboratory researches and develops leading-edge, efficient combustion and pollution abatement technologies aimed

at increasing the effectiveness of energy utilization and reducing greenhouse gas emissions, acid rain precursors, particulates and air toxics. Stationary source applications include utility boilers, industrial processes, and residential and commercial systems fired by natural gas, oil, coal, biomass or waste fuels.

Natural Resources Canada,
www.nrcan.gc.ca/es/etb/cetc/cetchome.htm
Bob Fraser, (613) 996-6079,
bofraser@nrcan.gc.ca

Energy Technologies for High-Temperature Processes Program (EHTP)
This government–industry partnership reviews new technologies aimed at ensuring the sustainability of Canada's metallurgical and coal industries. The program examines technologies that reduce energy and production costs in the metals industry, and develops better products and new markets for the coal industry.

Natural Resources Canada,
www.nrcan.gc.ca/es/etb/cetc/cetchome.htm
John Price, (613) 996-0089, jprice@nrcan.gc.ca

Energy Efficiency / Energy Management

Industrial Process Engineering Program
The Industrial Process Engineering program aims to build a Canadian capacity to improve the existing dryer base for a variety of industries by improving the energy intensity of the dryer base and drying technologies to upgrade residues. The program performs audits on industrial dryers, commercializes pulse fluid bed and jet-spouted-bed dryers for the agri-food industry, develops and commercializes intelligent control systems for dispersion-type dryers, assesses the opportunity for advances controls in the drying industry, and assesses the potential of new residue upgrading technologies.

Natural Resources Canada,
http://cedrl.mets.nrcan.gc.ca/e/activities_e.html
Jean Paquette, (450) 652-5997,
jpaquett@nrcan.gc.ca

Industrial Process Integration Program
The Industrial Process Integration program supports the development and deployment of process integration in various industries. The program focusses on water network optimization methodologies in the agri-food, pulp and paper and textile industries; combined heat and power optimization methodologies, total site optimization methodologies, and the building of an international calibre Canadian capacity in process integration.

Natural Resources Canada,
http://cedrl.mets.nrcan.gc.ca/e/activities_e.html
Jean Paquette, (450) 652-5997,
jpaquett@nrcan.gc.ca

Industry Energy Research and Development (IERD)
The Industry Energy Research and Development program supports the development and use of energy-efficient processes, products, systems and equipment by industry with a view to contributing to a cleaner environment. Technology development is conducted with all Canadian industrial sectors and is cost-shared with industry and other project participants.

Natural Resources Canada,
www.nrcan.gc.ca/es/etb/cetc/cetchome.htm
Mike Burke, (613) 996-6612,
mburke@nrcan.gc.ca

Mining and Mineral Sciences Laboratories
The Mining and Mineral Sciences Laboratories conduct research in underground mine environment, and mine mechanization and automation to reduce energy use in the mining industry. Automated ventilation management and mine mechanization can substantially increase overall mining efficiency and reduce the energy used to supply underground workers with necessary air, temperature, light and space requirements. One project under this initiative, being developed by a North American consortium, is the replacement of diesel with hydrogen fuel cells in underground production vehicles. If successful, the project is projected to reduce CO_2 emissions by 700,000 tonnes per year and electrical consumption by 15 percent, while increasing productivity by at least 15 percent.

Natural Resources Canada,
www.nrcan.gc.ca/mms/sandt-e.htm
Roy Sage, (613) 947-6604, rsage@nrcan.gc.ca
Michel Grenier, (705) 677-7815,
mgrenier@nrcan.gc.ca

National Fuel-Cell Research and Innovation Initiative
This joint Government of Canada, industry and university effort funds two initiatives: the Vancouver-based National Research Council's (NRC) National Fuel Cell

Technology Centre, a national, industrially-focussed research program; and a joint NRC–Natural Sciences and Engineering Research Council (NSERC) Fuel Cell Network and Targeted Research Program. The National Fuel Cell Technology Centre conducts collaborative industrial research, technology development, demonstration and deployment related to the use of fuel cells for alternative energy production. The research fund supports collaborative Canadian university–industry research for the development of fuel cells and fuel cell systems.

National Research Council Canada, www.nrc.ca
Rod McMillan, (604) 221-3041,
rod.mcmillan@nrc.ca

Program of Energy Research and Development (PERD)

This program supports and complements a wide range of energy science and technology programs related to sustainable development in the energy sector, excluding nuclear energy. Programs in Canada are being undertaken in partnership with 11 Government of Canada departments and agencies. International collaborations also provide opportunities for shared research and development (R&D) and expertise with other countries, primarily in Europe and the United States. All R&D projects focus on environmentally and economically sustainable technologies in the areas of energy production, energy end-use, renewable sources, CO_2 management, and R&D support for regulation of energy supply activities.

PERD projects are being undertaken to address its six main strategic intents:

1. Diversification of Canada's oil and gas
   Noël Billette, (613) 992-3738,
   nbillett@nrcan.gc.ca
   Sue Sim-Nadeau, (613) 996-7836,
   ssimnade@nrcan.gc.ca
2. Cleaner transportation for the future
   Kathleen Hollington, (613) 947-1021,
   kholling@nrcan.gc.ca
3. Energy-efficient buildings and communities
   Janice Zinck, (613) 992-1131, jzinck@nrcan.gc.ca
4. Energy-efficient industry
   John Gorjup, (613) 947-4245,
   jgorjup@nrcan.gc.ca
5. Canada's electricity infrastructure
   Noël Billette, (613) 992-3738,
   nbillett@nrcan.gc.ca
6. Canadian energy sector's response to the impacts of climate change
   Gilles Mercier, (613) 995-9454,
   gmercier@nrcan.gc.ca

   Natural Resources Canada,
   www.nrcan.gc.ca/es/oerd/
   Graham Campbell, (613) 995-8860,
   gcampbe@nrcan.gc.ca

Oil and Gas

Advanced Separation Technologies (AST)

This program conducts fundamental and applied research to find solutions for industrial science and technology problems. AST uses a multi-disciplinary team approach to develop and implement leading-edge separation technologies for the petroleum and environmental industries. This approach involves strategic partnerships and collaborative initiatives with industry, educational institutions, governments and the scientific community.

Natural Resources Canada,
www.nrcan.gc.ca/es/etb/cwrc/
Hassan Hamza, (780) 987-8617,
hamza@nrcan.gc.ca

Gas Hydrates Research Program

This program is helping to fund a joint government-industry undertaking to develop and test new exploration and production technologies in order to better understand the distribution and character of gas hydrate reserves. While these reserves represent a possible alternative energy source, they could increase greenhouse gases in the atmosphere if released naturally as a result of climate warming.

Natural Resources Canada,
http://sts.gsc.nrcan.gc.ca/page1/clim/
Scott Dallimore, (250) 363-6423,
sdallimo@nrcan.gc.ca

International Energy Agency (IEA) Weyburn CO_2 Monitoring Project

This four-year, $35 million research program is developing a comprehensive understanding of CO_2 behaviour in oil-bearing geological structures. Through detailed research and measurement, an international research team will verify the effectiveness of CO_2-based Enhanced Oil Recovery as a method of managing greenhouse gas emissions, providing direction and

leadership for similar projects in Canada and around the world. To date, the Government of Canada has contributed $1 million to this project.

www.nrcan.gc.ca/es
Geoffrey Browning, (613) 996-3810,
browning@nrcan.gc.ca

National Centre for Upgrading Technology (NCUT)
This joint Canada-Alberta heavy oil and bitumen upgrading research program provides independent research and technical services to help industry reduce the operating and capital costs and greenhouse gas emissions associated with converting heavy oil and bitumen into value-added products such as transportation fuels.

Natural Resources Canada,
www.nrcan.gc.ca/es/etb/cwrc/canmetmain.htm
Bill Dawson, (780) 987-8656,
bdawson@nrcan.gc.ca

Petroleum Technology Research Centre (PTRC)
The goal of this Saskatchewan-based research and development organization is to ensure the ongoing production of oil in Saskatchewan. A joint program of the Saskatchewan Research Council, the University of Regina, Saskatchewan Energy and Mines, and the Government of Canada, PTRC works in close collaboration with industry participants to ensure that the findings of the work it supports are applied by the petroleum industry.

Petroleum Technology Research Centre,
www.ptrc.ca
Roland Moberg, (306) 787-8290,
moberg@src.sk.ca

Processing and Environmental Catalysis Program
The Processing and Environmental Catalysis program focuses on the development of environmentally sound and economically viable technologies for the production of alternative and renewable transportation fuels, fuel additives and petrochemicals from natural gas, light hydrocarbons and renewable sources. Advanced catalytic systems and technologies are being developed for the conversion of natural gas to liquids, the re-refining of used oil, the reduction of mobile emissions, the blending of bio-fuels and the conversion of low-grade heat to electricity.

Natural Resources Canada,
www.nrcan.gc.ca/es/etb/cetc/cetchome.htm
Safaa Fouda, (613) 995-6392,
sfouda@nrcan.gc.ca

Renewable Energy

Energy for the Forest (ENFOR)
The Energy for the Forest program funds research relating to Canadian biomass energy production. ENFOR projects advance our understanding of the role of biomass production in the global carbon cycle and generate knowledge and technology on forest biomass production. Projects include determining: the viability of using forest ecosystems for energy, the potential for off-setting the fossil fuel energy supply with bioenergy, and forest options for reducing atmospheric concentrations of carbon dioxide.

Natural Resources Canada,
http://nofc.cfs.nrcan.gc.ca/climate/
Dave Winston, (613) 947-8986,
dwinston@nrcan.gc.ca

Renewable Energy and Hybrid Systems for Remote Communities (RERC)
The Renewable Energy and Hybrid Systems for Remote Communities program accelerates the deployment of renewable energy technologies to more than 300 remote Canadian communities that are not connected to the main electricity grid or to natural gas networks. The program provides a platform to coordinate the activities of federal, provincial, and territorial government departments and electric utilities. For example, the program is collaborating with the Government of Canada's Department of Indian and Northern Affairs, the Canadian Electrical Association, and Aboriginal organizations to develop strategies for increasing the deployment of renewable energy technologies in remote communities. Using RETScreen, a computerized project assessment tool for renewable energy technologies, RERC provides community decision makers with the tools, information, knowledge, and part of the funding needed to assess the feasibility of renewable energy systems, select the most cost-effective technologies and implement projects. The program also focusses on the development, implementation and promotion of photovoltaic (PV) technologies for domestic and international markets. Private sector and other organizations eligible for RERC funding may

receive contributions of 40 percent of the purchase and installation costs of authorized systems, to a maximum of $50,000.

Natural Resources Canada,
http://cedrl.mets.nrcan.gc.ca
André Filion, (450) 652-5995,
afilion@nrcan.gc.ca

Renewable Energy Technologies Program (RETP)
The Renewable Energy Technologies Program supports Canadian industry's development and commercialization of cost-effective and environmentally responsible advanced renewable energy technologies that can serve as alternatives to conventional energy generation. These technologies include active solar energy, wind energy, small hydro (less than 20 megawatts) and bioenergy.

Natural Resources Canada,
www.nrcan.gc.ca/es/etb/cetc/cetchome.htm
Claude Barraud, (613) 996-6087,
cbarraud@nrcan.gc.ca

Alberta

Geological Sequestration of CO_2 in Alberta Project
This project, jointly funded by the Government of Alberta and the Government of Canada under the Western Economic Partnership Agreement, is assessing the suitability of Alberta's subsurface for CO_2 sequestration in one of five ways: use in enhanced oil recovery; use in enhanced coal bed methane recovery; storage in depleted oil and gas reservoirs; injection and sequestration in deep saline formations; and storage in salt caverns.

www.ags.gov.ab.ca
Stefan Bachu, (780) 427-1517,
stefan.bachu@gov.ab.ca,

Improved Coal Combustion Research
The Government of Alberta participates in an ongoing project to evaluate the combustion, heat transfer and pollutant characteristics of coal combustion in an enriched oxygen medium with recycled CO_2 from flue gas. Research is aimed at providing a credible database for the development of more energy-efficient fossil-fired power generation cycles, which can produce a purified stream of CO_2 for direct removal from a power plant.

Rick Nelson, (780) 427-0286,
richard.nelson@gov.ab.ca

Injection of CO_2 into Deep Alberta Coal Beds for the Production of Methane
Current research is directed towards developing synergies with O_2 / CO_2 recycling technology. For example, a coal-fired power plant would utilize the O_2 / CO_2 combination furnace to produce a pure CO_2 flue gas that would be captured and used in the coal bed methane technology for the recovery of methane. This would result in a zero-emission scenario.

Rick Nelson, (780) 427-0286,
richard.nelson@gov.ab.ca

Saskatchewan

International Test Centre for Carbon Dioxide Capture
The centre will develop technologies to capture carbon dioxide produced by the energy sector. Instead of allowing carbon dioxide to be released into the atmosphere, the centre will investigate new capture methods and new industrial uses for the gas. This could reduce the cost of CO_2 capture from coal-fired power plants to around $20 per tonne, and the potential for atmospheric emissions from power plants to zero, except for nitrogen.

www.gov.sk.ca/enermine
Malcolm Wilson, (306) 787-2618,
malcolm.wilson@sem.gov.sk.ca

Weyburn CO_2 Injection Monitoring Project
This monitoring project is a four-year research program to develop a comprehensive understanding of CO_2 injection into oil bearing geological structures. Through detailed research and measurement, an international research team will verify the effectiveness of Enhanced Oil Recovery (EOR) as a method of managing greenhouse gas emissions, providing direction and leadership for similar projects in Canada and around the world.

www.gov.sk.ca/enermine
Malcolm Wilson, (306) 787-2618,
malcolm.wilson@sem.gov.sk.ca

Prince Edward Island

Atlantic Wind Test Site, North Cape, PEI
The Atlantic Wind Test Site (AWTS) facilitates the evaluation, development and demonstration of wind energy systems and equipment. AWTS is an integral part of Canada's wind energy development program. Established in 1980 on the western tip of Prince Edward

Island, AWTS continues to develop and test wind energy designs, including wind/diesel hybrid systems.

www.gov.pe.ca/photos/original/wind_test_site.pdf
Carl Brothers, (902) 882-2746

Yukon

Green Power Initiative

This initiative encourages the production of energy from renewable sources in an environmentally sustainable manner. It has four key objectives: to displace diesel electricity production and reduce emissions of greenhouse and other gases, especially in communities served only be diesel-generated electrical power; to provide consumers with a green power option; to expand the technical capability to develop green power alternatives; and to improve the long-term cost effectiveness of green power alternatives. The initiative will achieve these objectives through research and development, demonstration, targeted technical information, development of standards, and youth education projects.

www.gov.yk.ca/pubs/green_power.pdf
Duncan Sinclair, (867) 393-5334,
duncan.sinclair@gov.yk.ca

Wind Power Program

The Yukon Development Corporation is conducting pilot scale applied research and development on wind energy. It has four test sites located throughout the Yukon to determine the wind regime, and a commercial scale wind turbine in production located on Haeckel Hill near Whitehorse. A second, larger commercial scale wind turbine is being installed August 2000. The goal of this program is to overcome the technical barriers (primarily ice accumulation) to commercial scale wind energy production.

Duncan Sinclair, (867) 393-5334,
duncan.sinclair@yec.yk.ca

BUILDINGS

Government of Canada

Buildings Energy Technology Advancement Plan (BETA)

The Buildings Energy Technology Advancement Plan is a cost-sharing program aimed at developing, commercializing and encouraging the adoption by industry of a new generation of technologies and residential and large buildings with improved energy efficiency and indoor air quality.

Natural Resources Canada,
www.nrcan.gc.ca/es/etb/cetc/cetchome.htm
Mark Riley, (613) 996-8151, mriley@nrcan.gc.ca

Refrigeration and Intelligent Buildings

This program focuses on the development and deployment of technologies in the areas of ground source heat pumps, refrigeration and intelligent buildings.

Natural Resources Canada,
http://cedrl.mets.nrcan.gc.ca
Andre Filion, (450) 652-5995,
afilion@nrcan.gc.ca

SUPPORTING TECHNOLOGY DEVELOPMENT

Government of Canada

Canadian Climate Change Solutions

Canadian Climate Change Solutions is an interactive multimedia information tool designed to provide an instant response to specific climate change related problems encountered by all sectors of the economy, in both domestic and international markets. Canadian Climate Change Solutions is available on CD-ROM and through the Internet providing a compendium of problems encountered world wide and the products, technologies and services that Canadian companies can deliver to resolve them.

Industry Canada, http://strategis.ic.gc.ca/ces
Tom Wright, (613) 954-3080,
tom.wright@ic.gc.ca

Canadian Environmental Technology Advancement Centres (CETACs)

The Government of Canada supports the operations of three CETACs strategically located in Quebec, Ontario, and Alberta, with offices in each major city to serve all Canadians. The CETACs work in partnership with provincial governments, environmental industry associations and the private sector. The CETACs are private sector, not-for-profit corporations, operating at arm's length from government. Each Centre's goal is to help small- and medium-sized enterprises commercialize environmental technologies by providing comprehensive

technical services, access to investment capital, business counseling, and regulatory and market analysis.

Environment Canada
Enviro-Access Inc., www.enviroaccess.ca
Ontario Centre for Environmental Technology Advancement (OCETA), www.oceta.on.ca
CETAC-West Inc., www.cetacwest.com
Abe Finkelstein, (819) 953-0226,
abe.finkelstein@ec.gc.ca
Fred Hendren, (819) 990-5859,
fred.hendren@ec.gc.ca

Climate Technology Initiative (CTI)
The Climate Technology Initiative, a multilateral initiative under the auspices of the United Nations Framework Convention on Climate Control (UNFCCC), promotes activities to: improve the transfer of technology for building the capacity to assess and implement new technologies; foster international cooperation for accelerated development and deployment of climate-friendly technologies and practices for all activities; and help reduce greenhouse gas emissions.

Natural Resources Canada,
www.climatetech.net/
Graham Campbell, (613) 995-8860,
grcampbe@nrcan.gc.ca

Environmental Technology Advancement Program
The Environmental Technology Advancement Program develops, uses and transfers Canadian know-how and technologies to help protect and enhance the environment at home and abroad. It accomplishes this by addressing key environmental issues such as climate change, clean air and clean water, while contributing to Canada's sustainable development objectives. The program supports the development and application of scientific support tools, technologies and know-how to address environmental priorities; partners with other experts and stakeholders to maximize resources in addressing key environmental issues domestically and globally; and enhances private sector capacity to respond to environmental challenges.

Environment Canada
Ed Norrena, (819) 953-3090,
ed.norrena@ec.gc.ca

Environmental Technology Verification Program
The Environmental Technology Verification (ETV) Program fosters the growth and marketability of Canada's environmental industry by providing validation and independent third-party verification of performance claims. The ETV Program promotes the credibility of Canada's environmental industry both domestically and internationally while building sustainable industry capacity at home. Companies receiving the Government of Canada "Certificate of Authenticity," are considered industry leaders, innovators and are usually able to access markets more effectively.

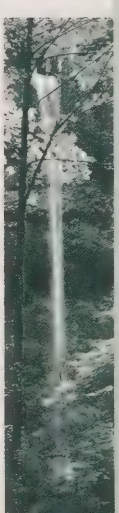
Environment Canada, www.etvcanada.com
Abe Finkelstein, (819) 953-0226,
abe.finkelstein@ec.gc.ca

Industrial Research Assistance Program (IRAP)
The Industrial Research Assistance Program will stimulate innovation in Canadian small and medium-sized enterprises, helping them to develop and adapt technologies. IRAP offers technical and business advice through a network of more than 250 advisors in 90 communities across Canada, and links companies to the appropriate resources and expertise to proceed in their innovation. IRAP can also offer financial support for research and development projects of Canadian small and medium-sized enterprises.

National Research Council, www.nrc.ca/irap
Jim Rollefson, (613) 993-7025,
jim.rollefson@nrc.ca

Technology Partnerships Canada (TPC)
TPC is a Government of Canada investment fund, investing in research and technology development to help strengthen Canada's technological capabilities in a range of critical areas. TPC invests in projects in three major areas: environmental technologies, enabling technologies, and the aerospace and defence industry. Environmental projects include the development of technologies related to pollution prevention, protection and abatement; water treatment; clean processes; recycling; clean cars; and renewable energy and energy efficiency.

Technology Partnerships Canada,
http://tpc.ic.gc.ca
Bruce Stuart, (613) 941-4671,
stuart.bruce@ic.gc.ca



Wastewater Technology Centre
The Wastewater Technology Centre is actively involved in climate change-related activities through their work in Clean Production and Pollution Prevention. For example, the Microwave-Assisted Processes MAPTM) are a family of clean processing technologies that were developed and patented by Environment Canada as part of Canada's commitment to sustainable development. Other potential technologies are currently being evaluated for greenhouse gas reduction potentials as well as a hands-on program for validating greenhouse gas reduction claims.

Environment Canada, www.ec.gc.ca
Jocelyn Paré, (613) 990-9122,
jocelyn.pare2@ec.gc.ca

British Columbia

British Columbia Scientific Research and Experimental Development Tax Credit
In 1999, the Government of British Columbia implemented a 10 percent tax credit for eligible research and development, including for greenhouse gas technology.

www.fin.gov.bc.ca/itb/sred/
sredbulletins/01-99R2.htm
Joann Cain, (250) 387-9002,
joann.cain@gems2.gov.bc.ca

Fuel Cell Technology
British Columbia is continuing its investment in the development of BC's fuel cell manufacturing industry, fuel cell technology and fuelling infrastructure, and applications of fuel cell technologies to a wide range of consumer products. This builds on BC's past investment of $21 million since 1990 in support of the demonstration and commercialization of fuel cells. On-going discussions between governments, universities and private industry are exploring new projects using operational data and technical developments from the Greater Vancouver Fuel Cell Bus Demonstration Project completed in June 2000.

www.scitech.gov.bc.ca/
Dave Shepherd, (250) 356-9569,
dave.shepherd@gems5.gov.bc.ca

Green Economy Development Fund
BC's $3-million Green Economy Development Fund is providing contributions to green technology demonstration projects that are between the research and development stage and the commercialization stage.

www.gov.bc.ca/ges/
Ken Baker, (250) 387-1947,
ken.baker@gems7.gov.bc.ca

Green Venture Capital Program
BC's $1-million Green Venture Capital Program is helping small businesses raise money for developing and selling new environmental technologies and services. Investors in participating venture-capital corporations will receive a 30 percent provincial tax credit and will be required to hold their investments for at least five years.

www.gov.bc.ca/ges/
Ken Baker, (250) 387-1947,
ken.baker@gems7.gov.bc.ca

Alberta

Climate Change Technology Strategy
Alberta's Technology Strategy for the Management of Greenhouse Gas Emissions is now the responsibility of Climate Change Central, a public-private partnership. The strategy has two main objectives: to ensure effective development of technologies within Alberta to mitigate greenhouse gas emissions; and to capitalize on global opportunities for exporting climate-friendly technology solutions developed and adapted in Alberta. These objectives are to be accomplished by creating an enabling environment within Alberta, ensuring timely availability of required technologies. Through Climate Change Central, Alberta companies are working with government and academia on technological advances that will lead to improved competitiveness and lower environment impacts.

- **Carbon Management:** Government and industry are working on initiatives for capturing and disposing of CO2 in sites, such as depleted oil wells. Participants agree any such system must be proven safe, environmentally benign, effective, economical, and publicly acceptable.
- **Sinks:** Alberta scientists and other public and private sector staff played a major role in understanding agricultural sinks. Sinks remove greenhouse gases from the atmosphere, by converting them through chemical processes or storing them in some other form.

www.climatechange.gov.ab.ca
Allan Amey, (403) 517-2700

Saskatchewan

Saskatchewan Petroleum Research Incentive
One of the main purposes of this incentive is to reduce the environmental impact of oil and natural gas production, which includes greenhouse gas emissions reduction. The financial support provided by the incentive is in the form of oil and natural gas royalty and tax credits which enable producers to deduct a portion of their companies' approved costs for research from their oil and natural gas royalty and tax payments.

www.gov.sk.ca/enermine
Howard Loseth, (306) 787-3379,
howard.loseth@sem.gov.sk.ca

CLIMATE CHANGE ACTION FUND — TECHNOLOGY EARLY ACTION MEASURES

The Government of Canada's Technology Early Action Measures (TEAM) component of the Climate Change Action Fund (CCAF) supports federal government programs that fund technology projects to reduce greenhouse gas emissions nationally and internationally, while sustaining economic and social development. TEAM projects will lead to significant reductions in greenhouse gas emissions and help Canada meet its commitments under the Kyoto Protocol. The CCAF has announced funding of $31 million to TEAM projects. Partners have contributed another $159 million in leveraged funding, resulting in a total commitment of nearly $190 million. Partners have included provincial and territorial governments, as well as business and industry, community organizations, and municipalities. The projects listed below have received funding from CCAF-TEAM.

Natural Resources Canada
Wayne Richardson, (613) 996-5419,
wsrichar@nrcan.gc.ca

Alternative Transportation Fuels

Domestic Projects

- The **Electric Vehicle Project – Montreal 2000** is using some 15 to 20 organizations to evaluate 30–40 electric vehicles of different models and makes to determine the viability of using battery-powered cars and light trucks to replace vehicles powered by internal combustion engines. The project evaluates various technical aspects, components and user acceptance levels.

  Environment Canada,
  www2.climatechange.gc.ca/ccaf/show_e.cfm?id=59
  Pierre Sylvestre, (514) 496-2657,
  pierre.sylvestre@ec.gc.ca

- The **Personal Fuel Appliance** project is helping Stuart Energy Systems Inc. develop and test two prototype water electrolysers, hydrogen refuelling appliances that produce hydrogen for zero emission fuel-cell vehicles. Ford Motor Co. will independently evaluate and test the appliance for possible use in its P2000 fuel-cell vehicles, expected to be on the market in 2004.

  Natural Resources Canada,
  www2.climatechange.gc.ca/ccaf/show_e.cfm?id=88
  Nick Beck, (613) 996-6022, nbeck@nrcan.gc.ca

- The **Technology Development for use in Natural Gas and Fuel-Cell Vehicles** project is developing intelligent control systems software that will make natural gas and fuel cell vehicles more cost competitive with conventional vehicles. The software can perform a number of individual processes simultaneously, including monitoring and controlling the gaseous injection and fuel storage systems. The software makes the conversion of conventionally fuelled vehicles to natural gas simpler and, therefore, less costly. The adoption of natural gas and fuel-cell vehicles by consumers could reduce CO_2 emissions by 0.4 megatonnes by 2005 and 1.5 megatonnes by 2010.

  Natural Resources Canada, www2.climatechange.gc.ca/ccaf/show_e.cfm?id=392
  Andy Bergszaszy, (613) 995-8557,
  abergszaszy@nrcan.gc.ca

International Projects

- The **Natural Gas Auto-Rickshaws in Pakistan** project is helping fund Ontario-based Yugo-Tech Inc.'s conversion of 30–45 auto-rickshaws to natural gas in Pakistan, using leading-edge natural-gas conversion technology. The conversion is expected to reduce CO_2 emissions by 76.5 tonnes or 21 percent per year. Yugo-Tech will also help Pakistan develop a natural

gas vehicle conversion centre, a government emissions test centre and will train technicians, drivers and emissions control officials.

Environment Canada,
www2.climatechange.gc.ca/ccaf/show_e.cfm?id=89
Fred Hendren, (613) 990-5859,
fred.hendren@ec.gc.ca

- The **Natural Gas Motorcycles in Egypt** project is helping fund Canadian-based Yugo-Tech Inc.'s development and refining of technology that will be used in a demonstration project in Egypt to convert gasoline-operated two-stroke motorcycle engines to run on compressed natural gas (CNG). Given the large number of two-stroke engine motorcycles in Egypt, converting these motorcycles to operate using CNG is expected to reduce annual CO_2 emissions by 21 percent, or a 1.0 tonne CO_2 reduction per motorcycle per year. Replication potential over a ten-year period in Egypt is expected to reduce total CO_2 emissions by 173,250 tonnes per year.

Industry Canada,
www2.climatechange.gc.ca/search_e.cfm
Nancy Hamzawi, (613) 952-1572,
hamzawi.nancy@ic.gc.ca

- The **Natural Gas Vehicles in Romania** project is helping fund the conversion of automobiles in Romania, using a bi-fuel natural gas fuel-injection system developed by the Saskatchewan Research Council. Initially five vehicles will be converted and tested. Mass production of these vehicles is expected to begin in 2001. The vehicles being tested or produced will reduce greenhouse gas emissions by about 16 tonnes per year, while the mass production of bi-fuel vehicles is projected to reduce greenhouse gas emissions by over 8,000 tonnes per year.

Natural Resources Canada, www2.climatechange.gc.ca/ccaf/show_e.cfm?id=87
Andy Bergszaszy, (613) 995-8557,
abergszaszy@nrcan.gc.ca

Buildings Technologies

- The **Advanced Integrated Mechanical Systems (AIMS)** project is a joint government – industry initiative designed to help manufacturers develop products and the market infrastructure for natural gas-fuelled appliances that integrate ventilation, space and hot-water heating into a single system. As many as six Canadian manufacturers are expected to develop AIMS products, with many others developing components. The project has the potential to increase the availability and affordability of high-performance mechanical ventilation systems in Canada. Using AIMS, instead of traditional products, is expected to reduce annual greenhouse gas emissions associated with ventilation, and space and water heating by an average of 25 percent in the 150 Canadian homes participating in a field trial.

Natural Resources Canada,
www2.climatechange.gc.ca/ccaf/show_e.cfm?id=212
James Glouchkow, (613) 943-9235,
jglouchkow@nrcan.gc.ca

Community Energy Systems

- The **Sudbury District Energy Project** is building a district energy system in downtown Sudbury, Ontario that uses a single heating and cooling system in several public buildings. The system will use a variety of energy sources, including heat produced by industrial processes, residual heat from power plants and renewable energy such as biomass to replace the city's individual heating and cooling systems and decrease the city's dependence on fossil fuels. The initial project is expected to result in a reduction of 21,000 tonnes of CO_2 emissions per year. Full expansion of the system could reduce emissions by up to 51,000 tonnes per year.

Natural Resources Canada,
www2.climatechange.gc.ca/ccaf/show_e.cfm?id=212
Michael Wiggin, (613) 996-8870,
mwiggin@nrcan.gc.ca

Energy Management

- The **Greenhouse Gas Emissions Reduction Through Energy Management in Brazil** project, a joint Government of Canada–private sector project, involves the development and implementation of seven energy management demonstration projects in seven industry sectors, representing about 50 percent of total manufacturing establishments in Brazil. The sectors include food processing, metal mechanics, textiles and leather, plastics, ceramics foundries, automotive parts and furniture manufacturing. If successful, the technology will be transferred to some 3,000 companies in the

target sectors, potentially reducing CO_2 emissions by 10,000 tonnes per year.

Industry Canada,
www2.climatechange.gc.ca/ccaf/show_e.cfm?id=221
Heather Schoemaker, (613) 954-3434,
schoemaker.heather@ic.gc.ca

Fuel Cells and Hydrogen

- The **Micro-Turbine / Cogeneration Heating and Power System** project is helping fund Suncurrent Industries' development of guidelines that optimize the performance of distributed cogeneration systems. Suncurrent is using the Walker Court condominium project in Calgary, Alberta, a combined residential and commercial building of 12 units, to monitor and analyze the effectiveness of a micro-turbine cogeneration system that provides heat and electrical power to the building. The company will use the data from this project to expand the application of cogeneration systems through efficient networks run under a central dispatch and control facility. The high-efficiency use of natural gas to provide both electricity and heat locally is expected to significantly reduce greenhouse gas emissions.

  National Research Council
  (Industrial Research Assistance Program),
  www2.climatechange.gc.ca/ccaf/show_e.cfm?id=219
  Raymond Lowry, (403) 210-5226,
  raymond.lowry@nrc.ca

- The **Solid Oxide Fuel Cell Development** project is helping fund Global Thermoelectric Inc.'s development of technology to create new levels of performance, cost effectiveness and durability for solid oxide fuel cells. The technology uses higher power density levels at lower temperatures (700°C). If successful, the technology will be applied in the oil, gas, telecommunications, residential and automotive markets.

  National Research Council, www2.climatechange.gc.ca/ccaf/show_e.cfm?id=220
  Alex Dickson, (403) 210-4239,
  alex.dickson@nrc.ca

- The **Solid Oxide Fuel Cell Combined Heat & Power Demonstration Plant** project, initiated by Kinectrics Inc. (formerly Ontario Power Technologies), is building and demonstrating a prototype solid oxide fuel cell combined heat and power plant — the world's largest such plant. When completed, the plant will generate 250 kiloWatts of electricity, enough to provide heat and electricity to about 50 homes, provide higher fuel conversion efficiency, eliminate energy losses due to power transmission/distribution, and reduce CO_2 emissions by 57 percent per year. With modifications, the plant is capable of using alternative fuels, such as propane or diesel.

  Natural Resources Canada, www2.climatechange.gc.ca/ccaf/show_e.cfm?id=401
  Norm Benoit, (613) 996-6165,
  nbenoit@nrcan.gc.ca

- The **Solid Oxide Fuel Cell Combined Heat & Power Demonstration Plant – Balance-of-Plant Development** project is helping fund Kinectrics Inc.'s (formerly Ontario Power Technologies) testing and improvement of prototype balance-of-systems components (i.e. fuel processors, compressors, heat exchangers) that will be used in the plant.

  Natural Resources Canada, www2.climatechange.gc.ca/ccaf/show_e.cfm?id=402
  Jim Rollefson, (613) 993-7025,
  jim.rollefson@nrc.ca

Oil and Gas Production

- The **Sustainable Development of Coal Bed Methane: A Life-Cycle Approach to the Production of Fossil Energy** project is developing a new technology process that increases the production of coal bed methane while storing CO_2. An international consortium, led by the Alberta Research Council, will test the process that injects CO_2 from industrial point sources into Alberta's vast, deep and unmineable coal bed gas reserves, that are rich in valuable methane. As the CO_2 is injected into a coal bed, it is stored in coal seams, displacing the methane gas. If adopted by the utility and petroleum production industries, this new process could lead to development of an unconventional natural gas resource and significantly reduce CO_2 emissions.

  Environment Canada, www2.climatechange.gc.ca/ccaf/show_e.cfm?id=216
  Tom Foote, (819) 994-1821, tom.foote@ec.gc.ca

Renewable Energy

- The **Automated Turbine Controls Project in China** will help fund Powerbase Automation Systems Inc.'s transfer and testing of five of its small automated turbine control

units at five small-hydro plants in China. The five demonstration sites are expected to reduce CO_2 emissions by about 30,000 tonnes per year through improved energy efficiency and the displacement of energy produced by coal. If testing is successful, Powerbase will retrofit another 55 sites in China by 2001.

Natural Resources Canada,
www2.climatechange.gc.ca/ccaf/show_e.cfm?id=58
Tony Tung, (613) 996-6119, ttung@nrcan.gc.ca

- The **Building Integrated Photovoltaics (BIPV) Demonstration** project, a one-year (2000–2001) demonstration project being undertaken by the British Columbia Institute of Technology (BCIT) and its partners, is using building-integrated photovoltaic (BIPV) technology (solar energy) to generate electricity for commercial, industrial and residential buildings. If successful, the technology could lead to the installation of 0.5 megawatts of peak capacity photovoltaic power in Canada by 2010, offsetting about 350 tonnes of greenhouse gas emissions annually.

Canada Mortgage and Housing Corporation,
www2.climatechange.gc.ca/ccaf/show_e.cfm?id=358
Chris Ives, (613) 748-2312,
cives@cmhc-schl.gc.ca

- The **Developing Photovoltaic Module Production Lines for Export** project will help fund Ontario-based ATS Automation Tooling Systems Inc.'s development and testing of automated assembly lines to produce photovoltaic (PV) panels for export. Initially, test sites will be set up in Canada and China, where fully functional PV panels will be installed and monitored. The PV panels at the test sites are expected to reduce CO_2 emissions by up to 130 tonnes annually.

Natural Resources Canada, www2.climatechange.gc.ca/ccaf/show_e.cfm?id=356
Lisa Dignard, (450) 652-5161,
ldignard@nrcan.gc.ca

- The **Development and Commercialization of Char into Activated Carbon** project is developing and commercializing a new process that converts char, a co-product of Ensyn Technologies Inc.'s patented Rapid Thermal Processing of biomass materials, into a high-value activated carbon. If successful, this carbon could be used as a charcoal filter in a variety of applications, including water treatment, and replace coal currently used as a feedstock for activated carbon.

Natural Resources Canada, www2.climatechange.gc.ca/ccaf/show_e.cfm?id=217
Ed Hogan, (613) 996-6226, ehogan@nrcan.gc.ca

- The **"Green Diesel" from Biomass Pyrolysis Oil** project is optimizing and deploying a microemulsion technology that will enable bio-oils produced from Ensyn Technologies Inc.'s patented Rapid Thermal Processing of cellulosic materials to be mixed with diesel. The use of bio-oil can produce heat and power and, as a 10 percent blend in diesel fuel, is expected to significantly reduce greenhouse gas emissions.

Natural Resources Canada, www2.climatechange.gc.ca/ccaf/show_e.cfm?id=218
Ed Hogan, (613) 996-6226, ehogan@nrcan.gc.ca

- The **Green Power Turbine** project is funding the installation of two waterfront windmills in downtown Toronto to provide an alternative to coal-fired electricity generation. Each wind turbine will provide 1,400 megawatt hours of energy per turbine, enough to power 250–300 households per year. The green power will be sold directly to Toronto customers.

Environment Canada,
www2.climatechange.gc.ca/ccaf/show_e.cfm?id=158
Les Welsh, (613) 953-1127, les.welsh@ec.gc.ca

- The **Use of Microwave Energy to Extract Cooking Oils From Plant Materials** project is helping fund implementation by CanAmera Foods and BC Research Inc. of Environment Canada's MAP™ technology to extract edible oils from agricultural material such as canola, flax and soya. The technology uses microwaves to selectively heat the residual moisture in plant materials, causing edible oils to be released into the surrounding unheated hexane solvent. The project will also assess the effectiveness and viability of using other solvents such as butane or propane. If successful, the project could result in the reduction of 120,000 tonnes of CO_2 emissions per year. Once all 10 Canadian CanAmera plants are converted to this process, the annual reduction of CO_2 emissions is predicted to be 1.2 megatonnes.

Environment Canada,
www.climatechange.gc.ca/ccaf/show_e.cfm?id=396

Jocelyn Paré, (613) 990-9122,
jocelyn.pare2@ec.gc.ca

Waste Treatment

- The **Methane Recovery from Landfills – Bioreactor Landfill Cells Demonstration Project in Cairo, Egypt** is demonstrating the recovery of landfill gas (mainly methane), for generating power. The project is divided into two phases: detailed site assessment and construction of two bioreactor cells (where waste will be treated and gases captured), and evaluation of the system's performance. The process's by-product can be used as compost material. This project has the potential for combined reduction of greenhouse gas emissions of about 4 million tonnes per year.

  Industry Canada,
  www2.climatechange.gc.ca/ccaf/
  show_e.cfm?id=394
  Nancy Hamzawi, (613) 952-1572,
  hamzawi.nancy@ic.gc.ca

Technology Early Action Measures / Technology Partnerships Canada

- The **Bio-Fuel Turbine Power Generation System** project is helping fund Orenda Aerospace Corporation's development and testing of systems for operating engines on liquid bio-oil fuel derived from feedstocks, such as wood, grasses, waste paper and agricultural residues. Under the project, Orenda will also redesign and refine the combustion system, and develop specifications for a full-scale power generation system. If successful, the technology is expected to reduce CO_2 emissions by 1.25 million tonnes per year by 2010.

  Technology Partnerships Canada, www2.
  climatechange.gc.ca/ccaf/show_e.cfm?id=160
  Michael Lenihan, (613) 946-8194,
  lenihan.michael@ic.gc.ca

- The **Enhanced Anaerobic Digestion of Municipal Solid Waste** project is helping fund Eastern Power Limited's development and demonstration of an innovative approach for treating the non-recyclable biomass components of municipal solid waste, recovered from "blue-box" recycling programs. The project is using a three-step modified anaerobic digestion process to create methane-rich biogas for power generation, and solid residue for use as compost or soil enhancement. The process is expected to reduce greenhouse gas emissions by 10.6 million tonnes of CO_2 per year by 2010.

  Technology Partnerships Canada, www2.
  climatechange.gc.ca/ccaf/show_e.cfm?id=214
  Kash Ram, (613) 954-5043, ram.kash@ic.gc.ca

- The **Ethanol from Biomass** project is helping fund Iogen Corporation's development and demonstration of a cost-effective process for the production of ethanol from a wide variety of biomass, including farm waste products such as straw and oat hulls. Blending 10 percent ethanol into all Canadian gasoline would decrease CO_2 emissions by 6.6 megatonnes by 2010.

  Technology Partnerships Canada,
  www2.climatechange.gc.ca/ccaf/search_e.cfm
  Kash Ram, (613) 954-5043, ram.kash@ic.gc.ca

- The **Gas Separation Technology** project is helping fund QuestAir Industries Inc.'s development of a unique gas separation technology that strips nitrogen and other gases from an air stream leaving pure oxygen. The technology will allow oxygen separation to occur over 200 times faster than traditional systems and result in smaller industrial oxygen plants. QuestAir is also exploring the use of this technology to increase the efficiency of fuel cells in automotive applications. The technology has the potential to reduce CO_2 emissions in Canada by 85,000 tonnes per year by 2006.

  Technology Partnerships Canada, www2.
  climatechange.gc.ca/ccaf/show_cfm?id=157
  Michael Hayes, (613) 954-4266,
  hayes.michael@ic.gc.ca

- The **Hydrogen Fleet Fuel Appliance** project is helping fund Stuart Energy Systems Inc.'s development and demonstration of a cost-effective system for improving the refuelling of hydrogen fuel-cell powered buses and other vehicles. The high-volume refuelling system enables bus companies operating fuel-cell vehicles to refuel more vehicles overnight, taking advantage of off-peak electricity rates. If successful, the technology has the potential to reduce greenhouse gas emissions by 123,000 tonnes per year by 2010.

  Technology Partnerships Canada,
  www2.climatechange.gc.ca/ccaf/search_e.cfm
  Michael Hayes, (613) 954-4266,
  hayes.michael@ic.gc.ca

SUSTAINABLE DEVELOPMENT

Government of Canada

Centre for Research in Cleaner Manufacturing
The Centre for Research in Cleaner Manufacturing, established in early 1999, develops scientific and engineering platforms for evaluating and guiding innovation in clean, commercially viable technologies and production processes, including those that help reduce greenhouse gas emissions.

National Research Council,
Don Singleton, (613) 993-4041

International Centre for Sustainable Development of Cement and Concrete (ICON)
The International Centre for Sustainable Development of Cement and Concrete conducts research and development, demonstration projects, transfer of technology and networking for the sustainable development of cement and concrete. The program aims to optimize the use of supplementary cementing materials (e.g. fly ash, slag, silica fume), recycled materials and other industrial by-products in concrete to reduce greenhouse gas emissions and consume high-volume waste product.

Natural Resources Canada,
www.nrcan.gc.ca/mms/canmet-mtb/mtl/ENG/advcdcon.htm
Benoit Fournier, (613) 992-8394,
bfournie@nrcan.gc.ca

Sustainable Development Technology Fund (SDTF)
This fund will support private sector-led projects aimed at accelerating the development and demonstration of new sustainable development technologies, with a particular emphasis on technologies that reduce CO_2 and other greenhouse gas emissions and provide air quality solutions. Projects related to climate change could include the development of technologies to improve energy efficiency, diversify Canada's energy supply mix to include more renewable sources and alternatives fuels, capture and store CO_2, and, for air quality solutions, reduce or remove particulates and other pollutants, such as ground-level ozone, toxins and heavy metals. The Government of Canada allocated an initial $100 million to this fund in the 2000 Budget. The fund is scheduled for implementation by March 31, 2001.

Natural Resources Canada
Graham Campbell, (613) 995-8860,
grcampbe@nrcan.gc.ca

OTHER

British Columbia

Beehive Burner Tax Shift Pilot
The Province is implementing a tax shift pilot project to encourage value-added uses for softwood residue, including the development of technologies to produce fuel ethanol, bio-oils, other chemical by-products and electricity. This project is revenue neutral to government by using increased waste management fees to provide rebates of permit fees to operators who invest in alternatives leading to the phase-out of their burners.

Brian Currie, (250) 387-9632,
Brian.Currie@gems3.gov.bc.ca

Alberta

CO_2 Synergies
The Government of Alberta participates in the "CO_2 Synergies" initiative. This initiative, which is led by the Alberta Chamber of Resources, focuses on developing commercial uses for CO_2 through research and development projects. A broad range of industry and government stakeholders participates in this initiative.

Rick Nelson, (780) 427-0286,
richard.nelson@gov.ab.ca

Canadians, like people throughout the world, are concerned about what's happening to our climate. They want to know more about the links between climate change and some of the severe weather we have been experiencing, and they want to know what they can do to help reduce greenhouse gas emissions. Throughout Canada, governments are undertaking and supporting initiatives intended to inform, educate and build Canadians' awareness of climate change, current and future impacts, and opportunities for personal action.

Enhancing Awareness and Understanding

CLIMATE CHANGE ACTION FUND — PUBLIC EDUCATION AND OUTREACH PROGRAM

The Government of Canada's Climate Change Action Fund: Public Education and Outreach (PEO) Program supports projects that build public awareness and understanding of climate change, and encourage Canadians to reduce their greenhouse gas emissions. The program aims to provide balanced information and to motivate positive changes in behaviour at home, at work and on the road.

The Climate Change Action Fund (CCAF) has funded 137 public outreach projects worth $16.6 million. Partners have contributed another $40 million in leveraged funding, resulting in a total commitment of nearly $56.4 million to increasing awareness and promoting action on climate change. Provincial and territorial governments have been key partners, lending their support through funding and participation in many of the projects. Other partners have included community organizations, businesses, municipalities, and the media. Examples of Public Education and Outreach projects are listed below. A complete summary of projects is available in the publication *Climate Change: Public Education and Outreach.*

www.climatechange.gc.ca
Environment Canada
Nicole Martel, (819) 997-6970,
nicole.martel@ec.gc.ca
Natural Resources Canada
Colleen Paton, (613) 996-0765,
cpaton@nrcan.gc.ca

Youth and Education

- The **Active and Safe Routes to School** program now reaches more schools and students, through a media campaign to increase awareness of school transportation issues related to climate change, and an action kit distributed to every elementary school in Canada. The Active and Safe Routes organization has also provided schools with a one-time grant to help implement the program and developed resources to help schools and planners address infrastructure issues related to routes to schools.

  www.goforgreen.ca
  Joy Kinnear, (613) 562-5336, info@goforgreen.ca

- FEESA, an Environmental Education Society, and Destination Conservation have developed an **Alberta Pilot for a National Education Initiative on Climate Change** to deliver education resources and training to teachers in all provinces and territories. The pilot focuses on producing print resources for use in Alberta classrooms, supporting teacher training, and encouraging action in schools and at home.

  www.dc.ab.ca
  David Dodge, (780) 433-8711, teachers@dc.ab.ca

- The Association professionalle des météorologistes du Québec Inc. (APMQ), a non profit group of scientists, will give free **Climate Change Presentations** to about 15,000 students aged 12 to 15 in Quebec.

  www.environet.qc.cq/apmq
  Gilles Brien, (514) 990-5338

- The **Multimedia Tour on Climate Change**, by the Fondation québécoise en environnement, promotes awareness of climate change through tours of 15 universities, 12 colleges, and three trade shows. The project includes an interactive information booth, a bilingual education CD-video, pamphlets, stickers, and posters.

  www.generation.net/~enviro
  Diane Collard, (514) 849-3323,
  enviro@generation.net

- **Youth in Media** invited 20 youth (aged 16-24) from British Columbia to develop concepts and write scripts for climate change public service announcements at the Gulf Island Film and Television School. Six of the PSAs were selected by CBC for airing in 2000 and can be viewed at the Youth in Media website.

  www.youthinmedia.com.
  Kathryn Molloy, (250) 995-0225,
  kathrynmolloy@home.ca

Individuals and Communities

- The Energy Council of Canada's **Action By Canadians on Climate Change** (the ABC Program) is a national grassroots public education and action campaign designed to engage Canadians in meeting Canada's target under the Kyoto Protocol. In its pilot year, workplace-based training sessions and educational tools were used to educate individuals about the role they can play in reducing Canada's greenhouse gas emissions, and an electronic database to monitor overall progress was created.

  www.energy.ca/abc
  Sarah Melamed, (613) 952-3316, abc@energy.ca

- The **Canadian Institute of Child Health (CICH)** will build public awareness and understanding of climate change and its effects on the health of Canadian children in urban and rural areas. CICH will distribute to health professionals a bilingual paper summarizing current information on the health impacts of climate change, convene 15 focus groups of parents from across Canada to determine awareness of climate change health impacts and barriers to behaviour change, and produce a series of information sheets for health professionals, parents and other groups.

  www.cich.ca
  Sandra Schwartz, (613) 230-8838,
  sschwartz@cich.ca

- The **Climate Change Calculator**, developed by the University of British Columbia, is an interactive software tool designed to raise awareness of greenhouse gas emissions from our everyday activities, and to offer solutions to their reduction. Support material for the calculator is being developed for use with climate change school programs.

  www.climcalc.net
  Alison Munro, (604) 822-9376,
  amunro@sdri.ubc.ca

- **Climate Change Solutions** is an Internet database of success stories and practical suggestions for reducing greenhouse gas emissions. Developed by the Pembina Institute for Appropriate Development, the site is tailored to meet the practical needs of different sectors, including individuals and families, communities and small municipalities, large companies, agriculture, and heavy industry. Within each sector, users will find detailed how-to information on tools and strategies.

  www.climatechangesolutions.com
  Janet Sumner, (613) 235-6288,
  janets@pembina.org

- Clean Nova Scotia has launched **Climate Change 2000** to build knowledge about climate change issues among community groups, and to help them develop and deliver local climate change programs. Workshops increased understanding of the basic science of climate change, the sources of greenhouse gas emissions in the province, the opportunities for reducing emissions, and the role of individuals and communities.

  www.clean.ns.ca
  Grant MacKenzie, (902) 420-3474,
  cns@clean.ns.ca

Science Outreach

- La Fondation des Partenaires de la Biosphère in Montreal opened a new exhibit on June 5, 2000, which will run until April 1, 2001. **Attention Climat!** addresses climate change science, impacts and adaptation as they relate to water quality and availability in the Saint Lawrence-Great Lakes ecosystem. The more than 100,000 people who visit the facility each year will be able to participate in creative workshops and debates, and learn more through educational material, film, interactive displays and multimedia.

  www.biosphere.ec.gc.ca
  André Champoux, (514) 496-8295,
  andre.champoux@ec.gc.ca

- The **Cape Jourimain Nature Centre** will create a Climate Change Information Centre at the Cape Jourimain National Wildlife Area, located near the Confederation Bridge in New Brunswick. This resource centre and its activities will include exhibits, personal interpretation programming, workshops, publications, education kits, and web site activity.

  Steve Ridlington, (906) 364-5040,
  steve.ridlington@ec.gc.ca

- The **Climate Change Communications Conference** held in June, 2000 was an international conference organized by the University of Waterloo to improve the capacity of the climate change communications community. Academic researchers, government and non-governmental representatives shared their expertise on climate change communications; identified research priorities; and established a communications network.

  http://geognt.uwaterloo.ca/c3confer
  Jean Andrey, (519) 888-4567,
  c3confer@fes.uwaterloo.ca

- The International Institute for Sustainable Development (IISD) is producing **Inuit Observations on Climate Change**, a video which will demonstrate the effect that climate change is having on the traditional lifestyle system of the Inuit on Banks Island in the Beaufort Sea. IISD will communicate the traditional knowledge of the Inuit regarding past changes in climate change, their adaptations in response to those climate changes, and whether such adaptation is still possible today given the current social, economic and political conditions.

  www.iisd.ca/casl/projects/inuitdos.htm
  Graham Ashford, (204) 958-7791,
  gashford@iisd.ca

- **Saskatchewan Science Centre** in Regina offers a hands-on, interactive exhibit that introduces visitors to the topic of climate change, and what individuals can do to reduce the causes and the impacts. In addition a mobile exhibit; "traveling toolkits" consisting of leaders' guides, materials and equipment; hands-on workshops; and science demonstrations will be used at science fairs, schools, exhibitions and communities throughout the province.

  www.sciencecentre.sk.ca
  Wayne Hellquist, (306) 791-7900,
  whellquist@accesscomm.ca

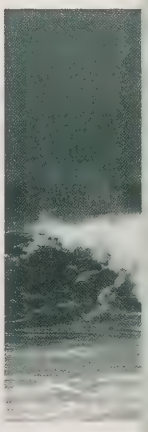
Transportation

- Sustainable Alberta and the Calgary Commuter Challenge are expanding the **Canada Commuter Challenge** to become an annual, nationwide event to take place during Environment Week (1st week of June). Currently, Canadians in six major urban centres are challenged each year to leave their cars at home as they head to work.

  www.commuterchallenge.net
  Kathryn Maier, (403) 283-1387,
  leaveyourcar@home.com

- BC Transit's successful **GO GREEN Choices Program** trains employees from participating workplaces to create and manage a trip reduction program, reducing both the number of single-occupancy vehicles traveling to work and greenhouse gas emissions. Currently available in Vancouver and Victoria, *GO GREEN* will expand training across BC and eventually across Canada.

  www.gogreen.com
  Chris Foord, (250) 385-2551,
  admin@gogreen.com



- Resource Conservation Manitoba is launching the **"Climate Action Now!"** project to provide citizens of Winnipeg with information on how they can reduce greenhouse gas emissions. The project includes initiatives to reduce idling and increase transit ridership. It also involves creating a *"Green Commuting Handbook"*. Resource Conservation Manitoba will also act as the provincial hub for the *Canadian Commuter Challenge*.

  www.escape.ca/~rcm
  Randall McQuaker, (204) 925-3777,
  rcm@escape.ca

- The Environmental Coalition of Prince Edward Island has undertaken a **Sustainable Transportation Initiative**. The initiative includes creating a PEI Ride network to increase ride-sharing; establishing a sustainable energy use clearinghouse; offering energy use assessments of workplaces and vehicles; and carrying out a one-day car emissions testing clinic in Charlottetown.

  www3.itas.net/~ecopei
  David McKay, (902) 566-4696, ecopei@itas.net

- **Transport 2000 Québec**'s 2000 campaign informed Quebecers about transportation, climate change and clean air issues. New to the 2000 campaign was

participation in the Canada Commuter Challenge. The month long initiative culminated on June 7, Clean Air Day, where activities included highlighting sustainable transportation at information kiosks, and showcasing technological innovations to reduce greenhouse gas emissions.

www.consommateur.qc.ca/t2000qc
Luc Côté, (514) 932-8008

Energy Efficiency

- The **Climate Change Action Plan**, sponsored by Eco-Action Sudbury (Ontario), is establishing marketing partnerships within the housing industry to target homeowners and encourage them to undergo evaluations under the Government of Canada's EnerGuide for Houses program. These evaluations help homeowners use energy as efficiently as possible, and reduce their greenhouse gas emissions.

  http://ecoaction.isys.ca
  Doreen Ojala, (705) 674-5208,
  ecoaction@on.aibn.com

- The **Energy Budget Decentralization Program**, sponsored by the Commission scolaire de la Rivière-du-Nord aims to realize a 10 percent reduction of greenhouse gases emitted by each of the Commission's 47 schools or buildings. Each building will engage in technical reviews, create an energy budget, implement energy programs and conduct follow-up.

  Gérard Molle, (450) 436-6721,
  molleg@csrdn.qc.ca

- The **Designed for Living** project, developed by the Canadian Home Builders' Association, is a social marketing approach to build consumer awareness of energy-efficient housing measures, and focuses on technologies that Canadian home builders have been trained to use. The project targets new housing and new home buyers. Information will be delivered through existing initiatives including the Government of Canada's R-2000 Home Program, EnviroHome and New Homes Month. Collateral benefits of energy efficiency will be emphasized, such as indoor air quality and increased comfort levels.

  www.chba.ca
  Gary Sharp, (613) 230-3060, gsharp@chba.ca

- The Government of Canada's **EnerGuide for Houses** program, delivered in Saskatchewan by the Sun Ridge Group, will be enhanced and expanded in Saskatchewan. The program will also raise awareness and understanding of climate change issues. Sun Ridge will work with members of community-based organizations, First Nations, renovation and real estate groups, and homeowners, to reduce their energy use and greenhouse gas emissions.

  David Fetsch, (306) 665-2525,
  sun.ridge@sk.sympatico.ca

- The **Residential Energy Efficiency Program (REEP)** is being implemented by the Faculty of Environmental Studies at the University of Waterloo using the Government of Canada's EnerGuide for Houses energy appraisal system and a community-based social marketing strategy. Approximately 3,500 home energy audits in the Waterloo Region will be completed over two years. The project seeks to build public awareness and understanding of the climate change issue and the link to personal energy consumption.

  www.fes.uwaterloo.ca/research/reep
  Daniel Scott, (519) 888-4567 ext. 5497,
  dj2scott@fes.uwaterloo.ca

Business

- The **Clean Annapolis River Project (CARP)** is seeking to reduce greenhouse gas emissions and increase carbon uptake on commercial farms, using the diverse agriculture industry of Nova Scotia's Annapolis Valley as a test area. CARP anticipates that the lessons learned in the Annapolis Valley will be transferable to other agricultural and rural areas across Canada.

  http://fox.nstn.ca/~carp
  Stephen Hawboldt, (902) 532-7533,
  carp@fox.nstn.ca

- Enviro-RIS's **Count-Me-In!** program is a two-hour interactive workshop that focuses on actions Canadians can take to reduce greenhouse gas emissions in their homes and on the road. The workshop is delivered in the workplace with company endorsement. The program's first phase targets 30 workplaces, with a potential audience of up to 2,700 employees, while the second phase is a "train-the-trainer" program.

  Maria Kelleher, (416) 480-2420 ext. 119,
  mkelleher@risltd.com

- **Industrial Parks and Climate Change**, a project being undertaken by Dalhousie University's School for

Resources and Environmental Studies, will develop strategies and technologies for reducing greenhouse gas emissions in industrial parks. They will use Debert Air Industrial Park in Nova Scotia as a model, providing design guidance and a plan of action. Results will be disseminated via newspaper and journal articles, Internet websites and presentations, to governments, educational institutions, and industrial park promoters, managers, developers and businesses.

www.mgmt.dal.ca/sres/eco-burnside
Ray Côté, (902) 494-1358, rcote@is.dal.ca

- PGF Enviro's **Programme pilote Enviroclub** is establishing four Enviroclubs, or networks of exporting manufacturers in Quebec, and four-day climate change awareness workshops for club participants. The workshops and follow-up will help participants identify and implement emissions-reduction projects in their factories, while increasing profitability and productivity. The Enviroclubs will reach some 60 small to medium-sized enterprises in different regions of Quebec.

Denis Morin, (819) 378-4911,
denis.c.morin@cegeptr.qc.ca

OUTREACH

Government of Canada

Awareness Initiatives
Through the Climate Change Action Fund, the Government of Canada has undertaken a range of initiatives to raise Canadians' awareness of climate change and of actions they can take to reduce emissions. In November 1999, seven million copies of a newspaper supplement entitled "Our Climate is Changing" were distributed to Canadian households. In addition, print and radio advertising, publications and information kits, a 1-800 number (1-800 O-Canada) and a climate change Web site have all contributed to Canadians' awareness of climate change, its impacts, and how to reduce greenhouse gas emissions.

www.climatechange.gc.ca
Nicole Martel, (819) 997-6970,
nicole.martel@ec.gc.ca

Climate Change Skills and Knowledge Transfer Program
The Soil Conservation Council of Canada delivers this initiative via its "Taking Charge" program, to assist farmers in identifying best management practices that can reduce greenhouse gas (GHG) emissions. Activities supported by this program include: the coordination and development of "grass-root" provincial teams to raise farmers' awareness of climate change issues; the development of information tools; the holding of provincial workshops on GHG-reducing activities; and a national conference to further their understanding of climate change issues.

Agriculture and Agri-Food Canada,
Soil Conservation Council of Canada
www.agr.ca/policy/environment/home.html
John Brown, (613) 759-7301, brownj@em.agr.ca

Eco-Action Funding Program
Eco-Action provides financial support to non-profit Canadian community-based groups that want to undertake local environmental projects that have measurable, positive impacts on the environment.

Environment Canada, www.ec.gc.ca/ecoaction
Sean Lynch, (819) 997-7321, sean.lynch@ec.gc.ca

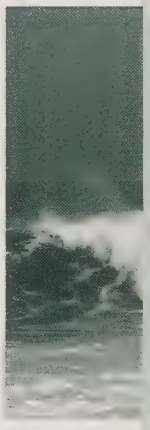
Millennium Eco-Communities (MEC)
The Millennium Eco-Communities initiative brings together resources for those interested in making a difference in their local community by improving the environment. MEC is a web site to both find and share information, a comprehensive resource on environmental issues, best practices, tools, tips, and networking opportunities.

Environment Canada, www.ec.gc.ca/eco
Alex Halkett Oberle, (819) 953-1595,
alex.halkett-oberle@ec.gc.ca

Public Information Program
The Public Information Program uses a variety of communication and marketing activities to increase Canadians' awareness of the environmental impact of energy use and encourage Canadians to adopt energy-efficient practices and use alternative transportation fuels.

Natural Resources Canada,
http://oee.nrcan.gc.ca
Martin G. Durand, (613) 943-2403,
mdurand@nrcan.gc.ca

Roundtable on Climate Change and Health
The Roundtable will increase the health sector's understanding of the links between air quality and climate change, from a health impacts perspective, and its



ability to engage and support climate change health-related actions undertaken by federal department and private sector organizations. It will also identify the role of health professionals, associations and academics in informing Canadians and encouraging behavioural modification, and in advocating for action to reduce the negative health effects of climate change. The purpose of the project is to support reductions in greenhouse gas emissions and to promote and protect the health of the public in the context of climate change.

Health Canada, www.cpha.ca
Pierrette Miron, (613) 946-5691,
pierrette_miron@hc-sc.gc.ca

British Columbia

BC Clean Air Day

Since 1992, the Government of British Columbia has proclaimed the Wednesday of Environment Week in June as Clean Air Day. For the past 4 years, the focus has been climate change. In June 2000, communities across BC participated in Clean Air Day events and commuter challenges to promote alternative transportation.

www.elp.gov.bc.ca/epd/epdpa/ar/cad/index.html
Kathy Goddard, (250) 387-9957,
kathy.goddard@gems3.gov.bc.ca

BC Climate Change Public Education and Outreach Initiative

British Columbia is working with federal and local governments, industry, and environmental organizations to establish a partnership that will coordinate and facilitate public education and outreach activities in BC.

Kathy Goddard, (250) 387-9957,
kathy.goddard@gems3.gov.bc.ca

Environmental Youth Team Program

British Columbia provides financial contributions through its Environmental Youth Team program to various agencies to hire youth to participate in environmental protection and education initiatives, including climate change.

Kathy Goddard, (250) 387-9957,
kathy.goddard@gems3.gov.bc.ca

Knowledge Network Television Series

British Columbia is working with Knowledge Network and other partners to produce a climate change television series and a set of half-hour videos.

Kathy Goddard, (250) 387-9957,
kathy.goddard@gems3.gov.bc.ca

School Projects

British Columbia is working with partners to develop a climate change support network for social studies teachers, using climate change as a teaching theme, identifying curriculum linkages, teacher training opportunities, and existing teaching resources.

Kathy Goddard, (250) 387-9957,
kathy.goddard@gems3.gov.bc.ca

Support to Outside Agencies

British Columbia continues to work in partnership with several BC-based organizations by providing technical advice and support to projects receiving funding from the Climate Change Action Fund, including the Canadian Climate Change Calculator, the Energy Aware Committee, BC Transit's Travel Options program, and Better Environmentally Sound Transportation Off Ramp! Program.

Kathy Goddard, (250) 387-9957,
kathy.goddard@gems3.gov.bc.ca

Alberta

Alberta Reduced Tillage Initiative (ARTI)

ARTI coordinates and presents programs and activities that disseminate quality, practical production information that will lead to the adoption of reduced tillage technology by Alberta producers. The partnership is based on a common philosophy about the benefits of reducing the amount and intensity of tillage. The greenhouse gas benefit is reduced fuel use and increased carbon storage in soil, which helps to reduce net greenhouse gas emissions.

www.agric.gov.ab.ca
Peter Gamache, (780) 427-3361,
peter.gamache@gov.ab.ca

Clean Air Strategic Alliance (CASA) Climatewise

Climatewise is an initiative to reduce greenhouse gas emissions in Canada. The project is being conducted in order to understand the barriers that inhibit Albertans from taking actions to reduce greenhouse gas emissions, as well as stimulate behaviour change that will result in reduced greenhouse gas emissions. The pilot will start in the fall 2000 in four Alberta communities. This project builds on current and planned national and provincial outreach programs. The Count Me In program, climate change trivia tools, and a government employee "in reach" program, CO_2 Diet, are also incorporated into the program.

www.casa-home.org
Brent Lakeman, (780) 422-8463,
brent.lakeman@gov.ab.ca

Climate Changes
Alberta Environment is a partner with FEESA, an Environmental Education Society, and Destination Conservation in the national education initiative, Climate Changes, developing educational resources on global climate change. These will be delivered through professional development workshops to science and social studies teachers in the Destination Conservation network and other education networks across Canada.

www.feesa.ab.ca
Jim Martin, martin@feesa.ab.ca

Destination Conservation School Retrofit Program
Destination Conservation (DC) enrolls school jurisdictions in a retrofit program. Students, teachers and other school staff audit their school's energy consumption and develop plans to reduce consumption through retrofits and lifestyle changes. Students monitor the process. There are currently 973 schools participating in the DC program across Canada.

www.dc.ab.ca
Bev Yee, (780) 427-5025, bev.yee@gov.ab.ca

Greenhouse Gas Awareness Project
The Alberta Food Processors Association (AFPA) is accelerating adoption of energy efficient practices through the Greenhouse Gas Awareness Project. The AFPA uses case studies to highlight leading-edge energy efficient activities. Funding was provided under the Alberta Environmentally Sustainable Agriculture Program.

www.agric.gov.ab.ca
Dave Ritchie, (780) 422-2556,
dave.ritchie@gov.ab.ca

Saskatchewan

1-800 Energy Conservation Line
Saskatchewan Energy and Mines is providing energy efficiency and conservation information to Saskatchewan residents through this toll-free telephone service.

www.gov.sk.ca/enermine
Brenda Maximuik, (306) 787-7662,
brenda.maximuik@sem.gov.sk.ca

Enhance Saskatchewan Environment and Resource Management (SERM)
The objective is to develop additional information on climate change relevant to Saskatchewan for the department's website, in order to improve Saskatchewan citizens' access to Saskatchewan-relevant information.

www.serm.gov.sk.ca/environment/
Everett Dorma, (306) 787-6127,
everett.dorma.erm@govmail.gov.sk.ca

Quebec

ÉcoGESte Program
The Quebec program to record voluntary action on climate change (ÉcoGESte) aims to involve as many people as possible from all areas of activity in taking voluntary action to reduce greenhouse gas emissions to their 1990 level. The Department of the Environment and the Department of Natural Resources are jointly responsible for the program.

www.menv.gouv.qc.ca
Roberte Robert, (418) 521-3970 ext 4920

Support Service for Low-Income Households
The object of this educational activity of the Agence de l'efficacité énergétique du Québec is to support the efforts made by households to make more efficient use of the energy they consume and thus reduce their energy bills. This is done in partnership with organizations in the community.

www.aee.gouv.qc.ca
Luc Morin, (418) 627-6379

Support Service for the Municipal Sector
The Agence de l'efficacité énergétique du Québec provides support for municipal authorities to offer education, training and awareness-raising concerning energy efficiency and the technical implementation of research and development and demonstration projects for the purpose of reducing their energy expenditures and the bills paid by their residents.

www.aee.gouv.qc.ca/20/220/page221.htm
Jean-Marc Robert, (418) 627-6379

New Brunswick

Driver Education
The objective of the Driver Education Program is to encourage the adoption of energy efficiency into the

driver-training curriculum. The activity involves marketing of curriculum material developed by the Government of Canada to driving schools in New Brunswick.

Public Education
The objective of the public education program is to encourage individuals to undertake actions that reduce energy use and greenhouse gas emissions. Examples of activities include response to public inquiries, support of workshops, seminars, implementation of Destination Conservation, and the public education and outreach strategy.

Rejean Thibodeau, (506) 453-2206,
rejean.thibodeau@gnb.ca

Nova Scotia

Climate Change Action Pack
The Climate Change Action Pack develops and distributes curriculum material on climate change to elementary schools in Nova Scotia. Material has been prepared and tested in workshops with teachers. Teacher kits, complete with lesson plans, curriculum linkages, and materials for classroom use by teachers and students have been prepared and will be distributed to 300 teachers in fall 2000.

Heidi Tracey, (902) 494-2831

Climate Change Public Education
Nova Scotia is seeking to increase public awareness and encourage action on climate change. Various climate change education activities have been implemented including workshops, videos, brochures and media materials. A feasibility study has been conducted on the creation of a climate change hub to co-ordinate and act as a catalyst for action. A pilot hub is expected to be launched in late 2000.

www.clean.ns.ca/programs/cchange.html
Meinhard Doelle, (902) 420-8802 or
1-800-665-5377,
George Foote, (902) 424-8168, gffoote@gov.ns.ca

Yukon

Energy Awareness Month
This education/awareness campaign is held each year in November. The campaign includes speakers, workshops, and articles in various media.

www.economicdevelopment.yk.ca/
Robert Collins, (867) 667-5015,
bob.collins@gov.yk.ca

Vehicle Emission Clinics
This annual clinic provides information to motorists about getting better mileage and reducing emissions of greenhouse gases and other pollutants. The clinic has been conducted annually since 1998; pass/fail results have improved each year (22, 21 and 18 percent failure rate), indicating that Yukon vehicle fleet may be improving in efficiency over time. This may correlate to per vehicle reduction in greenhouse gas emissions but it's not possible to quantify mass reductions or to extrapolate to entire Yukon vehicle fleet.

http://206.12.26.168/
Pat Paslawski, (867) 667-5934,
pat.paslawski@gov.yk.ca

Northwest Territories

Establishment of the Arctic Energy Alliance
The Arctic Energy Alliance is a non-profit society established through a partnership of several Government of the Northwest Territories departments, the NWT Power Corporation, NWT Housing Corporation, the NWT Association of Municipalities, and the NWT Public Utilities Board. The mandate of the alliance is to help communities, consumers, producers, regulators, and policy makers to work together to reduce the cost and environmental impacts of energy in the Northwest Territories.

www.aea.nt.ca/
Rob Marshall, (867) 920-3333,
rmarshal@aea.nt.ca

Public Awareness Program
The Public Awareness Program provides information about the wise use of energy to all segments of the population. The program, delivered by the Arctic Energy Alliance, provides energy reduction information in the form of pamphlets, fact sheets, television and radio announcements, displays and presentation.

www.gov.nt.ca/RWED/eps/energy.htm
www.aea.nt.ca/
Lloyd Henderson, (867) 873-7654,
lloyd_henderson@gov.nt.ca
Rob Marshall, (867) 920-3333,
rmarshal@aea.nt.ca

Governments in Canada do not expect their citizens to act where they themselves have remained idle. Throughout Canada, governments are showing leadership by putting their own houses in order, including their buildings and their fleets. They are sharing their experiences and best practices with others who can benefit from them.

Governments Leading by Example

Government of Canada

Federal Buildings Initiative (FBI)

The Federal Buildings Initiative helps organizations manage energy costs, while making their facilities more comfortable and productive workplaces. The program offers, to executive and managerial support, a complete package of tailored technical, planning and contractual support needed to implement an energy-saving project on a turnkey basis. The FBI also offers access to tools and services to assist organizations in planning a strategy to implement energy efficiency in federal buildings.

Natural Resources Canada,
http://oee.nrcan.gc.ca/fbi
John Brennan, (613) 947-0380,
jobrenna@nrcan.gc.ca

Federal House In Order Strategy (FHIO)

The Federal House in Order Initiative is a Government of Canada initiative to demonstrate federal leadership in the reduction of greenhouse gas emissions. The government's aim is to lower emissions from its own operations to an amount comparable to what is expected of all other Canadian organizations. An emissions reduction target for 2010 is being determined for the federal government as a whole, based on information provided by departments. The FHIO Initiative is a key part of the national process currently underway to develop a climate change strategy for Canada to help us meet our commitments to the Kyoto Protocol.

Natural Resources Canada,
Jim Comtois, (613) 943-0225,
jcomtois@nrcan.gc.ca
Environment Canada,
Loretta Legault (819) 994-8665,
loretta.legault@ec.gc.ca

Federal Industrial Boiler Program (FIBP)

The Federal Industrial Boiler Program (FIBP) ensures that energy-efficient and environmentally responsible technologies are considered when federal departments, agencies, Crown corporations or private-sector clients replace or modify their heating and cooling systems. FIBP develops site-specific strategies to help building operators meet higher equipment performance targets, and provides turnkey project management services on new or retrofit projects. These management services include preparing technical specifications, reviewing tenders, and overseeing the installation and commissioning of new equipment.

Natural Resources Canada,
www.nrcan.gc.ca/es/etb/cetc/cetchome.htm
Mike Burke, (613) 996-6612,
mburke@nrcan.gc.ca

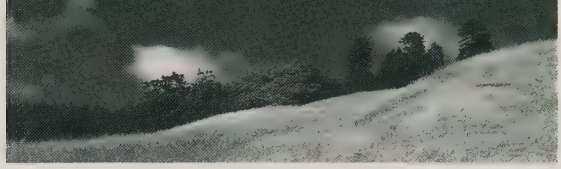
FleetWise Program

The FleetWise Program helps Government of Canada departments increase the efficiency of their fleets in order to cut costs and minimize the negative environmental impacts of operating fleet vehicles. The program builds on sound management practices by improving vehicle utilization, reducing fuel consumption, increasing the efficiency and environmental performance of vehicle operations and encouraging greater use of alternative fuels.

Natural Resources Canada,
http://oee.nrcan.gc.ca
Brian Farnand, (613) 996-7977,
bfarnand@nrcan.gc.ca

Green Power Procurement Initiative

This initiative commits the Government of Canada to displacing purchases of high-carbon electricity with electricity from emerging renewable sources, referred to as "green power". In addition to reducing greenhouse gas and other emissions in federal operations, this initiative provides a demand for green power and encourages electric utilities to market this type of power to other customers. The first pilot project using green power was undertaken with Enmax, an Alberta electric utility company. In the 2000 Budget, the federal



government committed an additional $15 million to expand its purchases of green power into Saskatchewan and Prince Edward Island.

Natural Resources Canada,
www.nrcan.gc.ca/es/erb/reed
Deirdre Hetherington, (613) 996-2596,
dhetheri@nrcan.gc.ca
Environment Canada,
Les Welsh, (819) 953-1127, leslie.welsh@ec.gc.ca

British Columbia

Alternative Fuel Vehicles

In fiscal year 2000-01, the Ministry of Transportation and Highways purchased 150 natural gas or propane vehicles to replace aging fleet vehicles. Fifty natural gas buses have been purchased in recent years.

Ministry of Transportation and Highways,
www.th.gov.bc.ca/bchighways/
nr_2000/80802.htm
Communications Branch, (250) 387-7788,
www.gov.bc.ca/th/cont/

BC's Government House in Order Action Plan

The province is preparing an inventory of government-source greenhouse gas emissions, a baseline forecast of emissions and an action plan to be submitted to Canada's Voluntary Challenge and Registry by Ministries and individual Crown Corporations. Actions under consideration focus on six key areas: leadership (establish a senior level champion and secure senior level commitment; implement an education and awareness program across government, share action plan with local governments); buildings (identify and implement most promising energy efficiency retrofits); electricity (purchase power from new green sources); transportation (reduce emissions related to the government fleet and employee travel); procurement policies (expand the environmental purchasing policy and increase emphasis on low emission products); waste reduction (expand reduce, re-use and recycling programs); and monitoring and reporting (establish an annual reporting mechanism).

Donna Sanford, (250) 356-1962,
donna.sanford@gems3.gov.bc.ca

Alberta

Alberta Government Voluntary Challenge and Registry (VCR) Action Plan

The Government of Alberta submitted an Action Plan to Canada's Climate Change VCR program in October 1995, setting an overall target of a 14.1 percent reduction of Alberta government emissions from 1990 levels by the year 2000. By 1998, the Alberta government had reduced its greenhouse gas emissions to 17.3 percent below 1990 levels, exceeding the emission target in both quantity and time. A post-2000 target is currently being considered from Alberta's VCR Action Plan. The Alberta government's leadership has been recognized through awards such as the Gold Level Reporter designation for achieving the most stringent reporting guidelines. Alberta also received the national VCR Leadership Award in 1999 for submitting the top government action plan.

www.vcr-mvr.ca
John Gibson, (780) 422-0106,
john.gibson@gov.ab.ca

CO_2 Diet Program In-Reach Initiative

The CO_2 Diet Program encourages government staff to take personal action to reduce greenhouse gas emissions at work and at home. The program, which is being piloted by Alberta Resource Development, Alberta Environment, and the Government of Canada, involves bi-weekly educational sessions on topics such as climate change science, policy and personal action, featuring speakers from government, industry and non-governmental organizations. Commuter Challenge, energy efficiency tips to staff and climate change trivia tools are also incorporated into the CO_2 Diet Program.

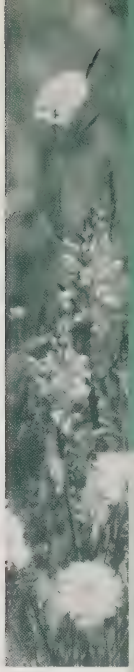
www.gov.ab.ca/env
Bev Yee, (780) 427-5025, bev.yee@gov.ab.ca

Saskatchewan

Energy Reduction Program

Saskatchewan Property Management Corporation (SPMC) has embarked on an initiative to modify or replace inefficient building systems, such as lighting and HVAC systems, as well as to install building control systems to increase the energy efficiency of government-owned buildings. The goal of the program is to reduce energy consumption by 20 percent.

Howard Arndt, (306) 787-2033,
howard.arndt@spmc.gov.sk.ca



Five-Axle Sanding/Snow Plow Trucks
Saskatchewan Highways and Transportation is using new technology to reduce the number of snow plow/sanding trucks while maintaining the same level of service, thereby reducing the overall fuel consumption per unit of work.

Randie Haines, (306) 933-5372,
rhaines@highways.gov.sk.ca

New Brunswick

Energy Accounting
The objective of the program is to provide energy accounting information to government building managers that allows them to manage energy use. It is a foundation program based on the philosophy that you cannot manage what is not measured. Activities involve the collection, analysis and reporting of energy use.

Rob Murray, (506) 453-2029,
rob.murray@gnb.ca

Provincial Buildings Initiative
The objective of the Provincial Buildings Initiative (PBI) is to improve energy efficiency in government-owned buildings. The initiative uses energy performance contracting as a delivery mechanism. All directly-funded government facilities are being considered for improvements, including physical retrofits, training, and awareness activities. Destination Conservation is being adopted in all New Brunswick schools. More than 95 percent of all government buildings have been considered under the initiative, resulting in $26 million in retrofit contracts in 370 buildings. Annual energy savings of $4.5 million are expected. The impacts of the initiative will be monitored over the next ten years. The budget for 2000 and 2001 is $70,000. Health and other environmental impacts are expected to be positive.

Rob Murray, (506) 453-2029,
rob.murray@gnb.ca

Prince Edward Island

Advanced Fleet Management System for the Provincial Highway Maintenance Fleet
This program will utilize Intelligent Transportation Systems in planning, implementing, and deploying a fleet management system that will facilitate and foster improved route planning and scheduling of maintenance fleet; improved management of inventory control for materials; improved safety and efficiency of the maintenance fleet; real-time fleet location and status monitoring; improved response time for road salt/sand application; and reduced operating costs.

Cathy Worth, (902) 368-0271,
ceworth@gov.pe.ca

Yukon

Energy Management Planning and Performance Standards
The Yukon government is striving to set the example of sound energy management by demonstrating energy-saving systems and by providing a market for energy efficiency products and services. It has developed energy performance standards for Yukon government facilities. An overall energy management plan identifies opportunities to reduce operating costs and greenhouse gas emissions.

www.gov.yk.ca/depts/dgs/Govserv.htm
Pat Hogan, (867) 667-3064,
pat.hogan@gov.yk.ca

Northwest Territories

Energy Conservation Capital Program
The Energy Conservation Capital Program (ECCP), developed in the mid-1980s, assists territorial and community funded departments, boards and agencies, as well as non-profit organizations, by providing grants to support and finance projects which reduce usage of electrical and heat energy, and water.

www.gov.nt.ca/RWED/eps/energy.htm
Lloyd Henderson, (867) 873-7654,
lloyd_henderson@gov.nt.ca,

Good Building Practice for Northern Facilities
The Department of Public Works and Services has prepared a set of building design guidelines to help ensure that Government of the Northwest Territories facilities are designed and constructed to minimize life-cycle costs. As utility costs are a major component of the owning and operating costs of a facility, there is considerable emphasis on energy efficiency in the guidelines.

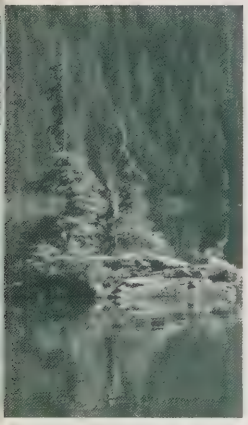
www.gov.nt.ca/PWS/index.htm
Joe Auge, (867) 873-7829, joe_auge@gov.nt.ca

Municipal

Green Municipal Enabling Fund and Green Municipal Investment Fund

The Green Municipal Enabling Fund (GMEF) and the Green Municipal Investment Fund (GMIF), managed by the Federation of Canadian Municipalities and operating in partnership with the Government of Canada, are endowment funds that provide support for a variety of municipal environmental activities. The five-year, $25-million GMEF supports feasibility studies for innovative environmental projects within municipal operations. The $100-million GMIF, which will operate in perpetuity, provides loans and loan guarantees to eligible recipients to carry out environmental projects within municipal operations, as well as grants and long-term loans for pilot projects. Both funds began operating in fiscal year 2000-2001.

Natural Resources Canada,
http://oee.nrcan.gc.ca
Louise Métivier, (613) 995-2692,
metivier@nrcan.gc.ca
Environment Canada, www.ec.gc.ca
Pierre Boileau, (819) 994-6143,
pierre.boileau@ec.gc.ca



Municipal Building Retrofit Program

The Municipal Building Retrofit Program encourages the adoption of energy efficiency in the municipal sector by providing municipalities with all of the elements necessary to identify, develop, finance and implement comprehensive building energy retrofits.

The program, which will be offered from 2000 to 2003, will be operated by the Federation of Canadian Municipalities in partnership with the Government of Canada.

Natural Resources Canada,
http://oee.nrcan.gc.ca
Louise Métivier, (613) 995-2692,
metivier@nrcan.gc.ca

The earth's climate is changing, and the impacts of climate change will be felt across national borders, ecosystems, and economic sectors in the decades to come. Responding to climate change is one of the most complex challenges facing all governments. Programs in this area are developing the knowledge, capacity, and experience to enable policy-makers to make informed future decisions and lay the foundation for future action. Canada is also helping countries throughout the world build their knowledge and capacity on climate change.

Investing in Knowledge and Building the Foundation

SCIENCE

Government of Canada

Climate Processes and Modelling

Climate Modelling and Analysis Program
This program develops and uses sophisticated atmospheric and coupled climate models and advanced analysis of observed data and model output to improve understanding of present, past and future climates. The models and analysis tools are used in short-term climate forecasting, for studies of climate predictability and variability, and to project and analyse the future climate change that will result from the anthropogenic changes in the composition of the atmosphere.

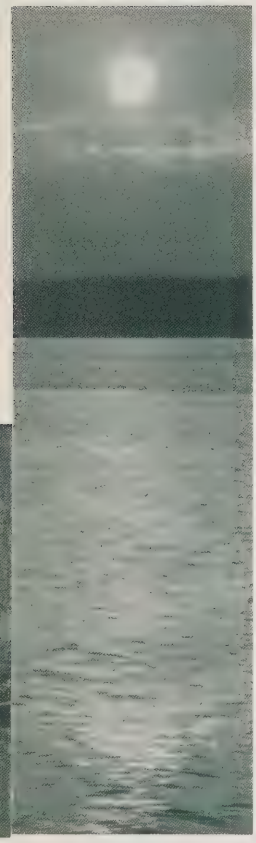
Canadian Centre for Climate Modelling and Analysis (CCCma), www.cccma.bc.ec.gc.ca/
Francis Zwiers, (250) 363-8229, francis.zwiers@ec.gc.ca

Climate Processes and Earth Observation Program
This program conducts research to improve the understanding of energy and water cycles and their component processes, particularly in cold climates. The program is also developing and implementing improved remote sensing and field measurement methodologies, and emphasizes the measurement and modelling of land surface processes and the evaluation and application of regional climate and weather models as integrating tools.

Environment Canada, Fisheries and Oceans Canada, Natural Resources Canada,
www1.tor.ec.gc.ca/index.html
Climate Research Branch:
www.msc-smc.ec.gc.ca/crb/home_e.cfm
Mackenzie GEWEX Study (MAGS):
www.msc-smc.ec.gc.ca/GEWEX/MAGS.html
Cryospheric System to Monitor Global Change in Canada (CRYSYS):
www.msc-smc.ec.gc.ca/CRYSYS/
BERMS (Boreal Ecosystem Research and Monitoring Sites):
http://ecsask68.innovationplace.com/
Barry Goodison (Environment Canada), (416) 739-4345, barry.goodison@ec.gc.ca
Allyn Clarke (Fisheries and Oceans), (902) 426-5153, clarkea@mar.dfo-mpo.gc.ca
Josef Cihlar (Natural Resources Canada), (613) 947-1265, cihlar@nrcan.gc.ca

The Climate Research Network
This program engages the energies, ideas and talents of the university community to expand and complement the scientific knowledge and expertise available in the country with respect to climate change and climate variability. It currently consists of a network of nine collaborative research groups in 18 Canadian universities. Each group focuses on a specific area of climate research.

Canadian Institute for Climate Studies (CICS)
www.cics.uvic.ca/
Doug Whelpdale, (416) 738-4869, douglas.whelpdale@ec.gc.ca



Remote Sensing Datasets for Global Climate Modelling Initiative

This initiative uses global data on surface radiation retrieved from satellite measurements to inform climate modeling researchers. The researchers use these datasets to assess and improve the performance of general circulation models (GCMs).

Natural Resources Canada,
www.ccrs.nrcan.gc.ca
Zhanqing Li, (613) 947-1311, li@nrcan.gc.ca

World Climate Research Programme

The World Climate Research Programme furthers scientific understanding of the climate system and climate processes. Within the program, Canadian scientists are working on the World Ocean Circulation Experiment and the Joint Global Ocean Flux Study to help improve understanding of ocean processes and to contribute to the development of ocean components of climate models. Canada is also participating in the Global Energy and Water Experiment by studying hydrological processes in the permafrost-saturated and largely snow-covered lands of the Mackenzie River Basin.

Environment Canada,
Doug Whelpdale, (416) 739-4869,
douglas.whelpdale@ec.gc.ca

Greenhouse Gas Sources and Sinks

Arctic Climate Science Research Cooperation with Japan

The Arctic Climate Science Research Cooperation is a bilateral multi-disciplinary program involving government and university interests in Canada and Japan. The project will complement existing international climate change programs. Research results will form the basis for policy deliberations on climate change impacts on biodiversity, human conditions, marine habitat, Arctic's role as sources and sinks, long-range transport and storage of pollutants in the Arctic Ocean, etc.

Fisheries and Oceans Canada,
Natural Resources Canada, Environment Canada
Peggy Tsang, (613) 998-2904,
tsangp@dfo-mpo.gc.ca

Greenhouse Gases and Aerosol Measurement Program

The overall objective of this program is to contribute to our understanding of greenhouse gases and aerosols – their trends, budgets and role in climate change – by carrying out measurements, modeling and process studies with a Canadian focus and by interfacing with other major international programs. There are currently three major areas of research: (i) greenhouse gas and aerosol measurements as part of Canada's contribution to the WMO Global Atmospheric Watch and other international programs; (ii) assessment of the role of the Canadian boreal forest and the Hudson Bay lowlands as sources/sinks of greenhouse gases; and (iii) assessment of the role of natural and anthropogenic aerosols in Canadian climate change.

Environment Canada,
Maris Lusis, (416) 739-4449,
maris.lusis@ec.gc.ca

International Geosphere-Biosphere Program

This multilateral program researches, monitors and assesses biomass burning.

Natural Resources Canada, www.igbp.kva.se
Mike Apps, (780) 435-7305, mapps@nrcan.gc.ca

International Institute for Applied Systems Analysis

The International Institute for Applied Systems Analysis collaborates on research related to forest carbon cycles in the Siberian forest and links with research being conducted by the International Boreal Forest Research Association.

Natural Resources Canada,
www.iiasa.ac.at/Admin/DI/Quarter/00-1/projects/for.html
Robert Stewart, (613) 947-9014,
rstewart@nrcan.gc.ca

Satellite Monitoring of Vegetation

This program uses satellite data to develop and demonstrate procedures for monitoring the seasonal development and carbon uptake of vegetation across the Canadian landmass.

Natural Resources Canada,
www.ccrs.nrcan.gc.ca
Josef Cihlar, (613) 947-1265, cihlar@nrcan.gc.ca

Agriculture

Agriculture and Agri-Food Canada (AAFC) Research Branch – General Research to Address Climate Change

The AAFC Research Branch undertakes extensive research and technology development to reduce greenhouse gas emissions from the agricultural sector.

Examples of research include the Prairie Soil Carbon Balance project (launched to refine measurement and verification protocols for soil carbon); studies aimed at reducing uncertainties in agro-ecosystem emissions estimates; farm-level greenhouse gas measurement; understanding the soil carbon storage mechanism, nitrogen flows and nitrous oxide emissions.

Agriculture and Agri-Food Canada,
http://res2.agr.ca/research-recherche/indexe.html
Christian De Kimpe, (613) 759-7824,
dekimpec@em.agr.ca
Ray Desjardins, (613) 759-1522,
desjardins@em.agr.ca

Canadian Economic and Emissions Model for Agriculture (CEEMA)

CEEMA is an integrated agro-ecological economic modeling system developed at Agriculture and Agri-Food Canada that can be used to simultaneously assess the economic and greenhouse gas emission impacts of agricultural policies at regional and national levels. The model is a quantitative tool that can contribute to policy analysis related to Canada's climate change goals through analyses of changing agricultural economics and production practices relative to patterns of greenhouse gas emissions.

Agriculture and Agri-Food Canada
Bob MacGregor, (613) 759-1796

Climate Change Funding Initiative (CCFI)

This initiative helps to improve the scientific understanding of the agriculture sector's contribution to greenhouse gas emissions. The CCFI has four major components. The first focuses on developing and increasing the pool of experts in the field of climate change in Canada by supporting projects involving graduate students in climate change science. The second component places a priority on the creation of science networks. The third brings experts together to share results and develop priorities for future action. Finally, the project sets in motion the coordination of climate change activities in Canadian agriculture within CARC that will continue beyond the CCFI program.

Agriculture and Agri-Food Canada
Canadian Agri-Food Research Council (CARC)
www.carc-crac.ca/english/climatechng/default.htm
Keith MacLeod, (613) 759-7307,
macleodk@em.agr.ca
Les Haley, (613) 759-7333, haleyl@em.agr.ca

Matching Investment Initiative (MII)

The MII increases collaborative research activity between the private sector and Agriculture and Agri-Food Canada (AAFC). The department will match industry's R&D contributions to collaborative research projects up to a maximum of one-for-one. The initiative, by involving industry research investors directly, will also help speed up the process of transferring new technology to the private sector. The MII contributes to the promotion and implementation of greenhouse gas-reducing practices in such areas as soil nutrient management, manure management, grazing strategies, feeding strategies, water management, agroforestry, food processing and soil carbon sequestration.

Agriculture and Agri-Food Canada
Pierre Sauriol, (613) 759-7852

Range Management Technology Transfer

The Prairie Farm Rehabilitation Administration (PFRA) investigates and provides technical information on the improvement of management of prairie rangeland resources (about 50 million acres), which can provide significant benefits for greenhouse gas sequestration. PFRA range management staff are working with Research Branch to develop firmer science on carbon sequestration potentials, and other greenhouse gas impacts. Appropriate management of the resources is estimated to result in an important greenhouse gas sink.

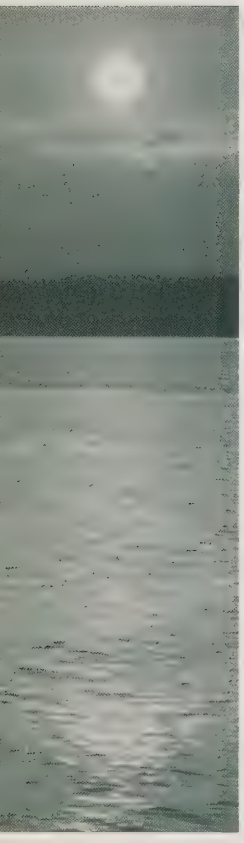
Prairie Farm Rehabilitation Administration (PFRA)
www.agr.ca/pfra/land/range.htm
Brant Kirychuk, (306) 780-6948,
kirychukb@em.agr.ca

Forests

Assessing the Carbon Budget of Circumpolar Forests

This project, a joint initiative with the United Kingdom, Russia and Scandinavia, involves collaboration to improve our understanding and management of the role of circumpolar boreal forests in the global carbon budget cycle.

Natural Resources Canada,
Robert Stewart, (613) 947-9014,
rstewart@nrcan.gc.ca



Boreal Ecosystems Productivity Simulator (BEPS) Program
This program uses remote sensing to quantify the terrestrial carbon cycle.

Natural Resources Canada,
www.ccrs.nrcan.gc.ca
Wenjun Chen, (613) 947-1286,
wenjun.chen@geocan.nrcan.gc.ca

Global Observation of Forest Cover (GOFC)
This program aims to improve the quality and availability of satellite observations of forests at regional and global scales and, together with in-situ observations, produce useful, timely and validated information.

Natural Resources Canada, www.gofc.org
Tim Perrott, (613) 947-7953, info@gofc.org

Role of Canada's Forests in the Global Carbon Cycle
This program consists of projects that aim to improve our understanding of carbon storage and release from Canada's forests under past, present, and future conditions. The projects also seek to define and evaluate forest management activities that might enhance and sustain storage of atmospheric carbon in our forests.

Natural Resources Canada,
www.nofc.forestry.ca/climate
Mike Apps, (780) 435-7305, mapps@nrcan.gc.ca

Systematic Climate Observations, Climate Monitoring and Analysis

Canadian Glaciology Program
This program collects and analyzes core samples from high Arctic and Cordilleran glaciers for past temperatures, snow accumulation and atmospheric concentrations of greenhouse gases, contributing to the international body of data that is needed to understand the long- and short-term effects of climate change.

Natural Resources Canada,
http://sts.gsc.nrcan.gc.ca/page1/clim
David Fisher (Arctic glaciers), (613) 996-7623,
fischer@nrcan.gc.ca
Mike Demuth (Cordilleran glaciers),
(613) 996-0235, mdemuth@nrcan.gc.ca

Climate Monitoring and Data Interpretation Program
This program monitors and analyses Canadian and global climate in order to determine the impact of human activities on climate trends and variations. The program uses integrated historical and proxy data sets to extend the climate record back 1,000 to 2,000 years. The program also funds the operation of a permafrost and active layer monitoring network, supporting the detection and monitoring of climate change in the Arctic.

Environment Canada, Fisheries and Oceans Canada, Natural Resources Canada
www.msc-smc.ec.gc.ca/ccrm/ccrm_e.cfm
Bill Hogg (Atmosphere), (416) 739-4348,
william.hogg@ec.gc.ca
Savi Narayanan (Oceans), (613) 993-4658,
narayanans@dfo-mpo.gc.ca
Art Dyke (Proxy data), (613) 992-0643,
adyke@nrcan.gc.ca
Margo Burgess (Permafrost), (613) 996-9317,
mburgess@nrcan.gc.ca

Global Array of Profiling Floats (Argo)
Argo is an international program that will collect ocean data necessary for understanding and predicting phenomena that influence our global climate, enabling the development of integrated atmospheric and oceanographic models. A global array of 3,000 profiling floats will observe the ocean's upper layer in real time. Canada has committed to the purchase of more than 20 floats today, and hopes to commit to 90–150 floats in the overall program.

Fisheries and Oceans Canada,
Environment Canada
Peggy Tsang, (613) 998-2904,
tsangp@dfo-mpo.gc.ca

Global Baseline Surface Radiation Network
Canada participates in an international radiation monitoring network called the Global Baseline Surface Radiation Network. Ground-based measurements are taken continuously using sophisticated equipment. These data are used along with satellite measurements to improve our understanding of how much energy is entering Earth's atmosphere and how much is leaving it. Canadian measurements are taken at Bratt's Lake in Saskatchewan and at the new stratospheric observatory at Eureka, in the Canadian Arctic.

Environment Canada,
Bruce McArthur, (416) 739-4464,
bruce.mcarthur@ec.gc.ca

Ice-core Circum-Arctic Paleoclimate Program (ICAPP)
This program is a Canadian-led international program that collects and studies ice cores around the Arctic in order to determine the timing, rate and cause of past global changes.

Natural Resources Canada,
Roy Koerner, (613) 996-7623,
rkoerner@nrcan.gc.ca

Paleo-Reconstruction of Climate Program
This program is helping support government, university and industry researchers in documenting a wide array of environmental conditions (e.g. tree rings, lake and marine sediments, the fossil record) that have taken place over the past 20,000 years. This information will be added to a major Canadian database that provides information on the long-term climate variability in Canada and its impacts.

Natural Resources Canada,
http://sts.gsc.nrcan.gc.ca/page1/clim/
Art Dyke, (613) 992-0643, adyke@nrcan.gc.ca

Saskatchewan

Canadian Council of Ministers of the Environment (CCME) Indicators Study of Climate Change
This project will develop preliminary indicators of climate change in Canada and publish them in a public-friendly document. The initiative is co-chaired by Environment Canada and Saskatchewan Environment and Resource Management.

Roger Street, (416) 739-4271,
roger.street@ec.gc.ca
Ron Zukowsky, (306) 787-6285,
ron.zukowsky.erm@govmail.gov.sk.ca

Yukon

Northern Climate ExChange
The Northern Climate ExChange serves as a northern entry point into the study of climate change in the circumpolar north. It conducts research and education on the impacts of, and adaptations to, climate change in the north; supports the development of resource efficient technologies and practices that can contribute to mitigating climate change impacts; and facilitates the exchange of scientific, traditional and local knowledge, technology, and expertise via a circumpolar "trade-route".

www.taiga.net/nce
Aynslie Ogden, (867) 668-8735,
aogden@yukoncollege.yk.ca

IMPACTS AND ADAPTATION

Government of Canada

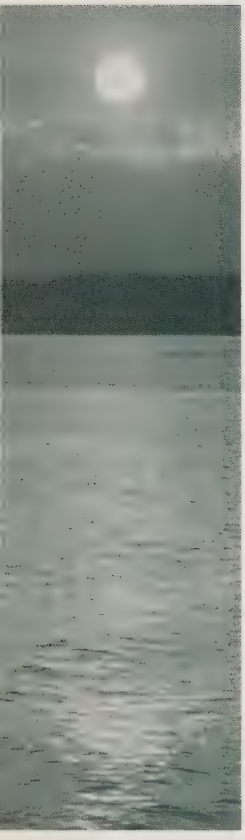
Adaptation and Impacts Research Program
The Adaptation and Impacts Research Program promotes and conducts research designed to increase Canadians' understanding of atmospheric change impacts and the required adaptations. These research activities are designed to provide Canadians with information on the environmental, social and economic risks and impacts caused by vulnerabilities to atmospheric change, variability and extremes, and on the viability of adaptive responses. The program focuses on a number of key research themes (e.g., integrated assessments, health and atmospheric change, human dimensions of weather and climate, water and climate variability and change, integrated air issues, adaptation and impacts science) and works in partnership with selected universities and Canadian and international collaborators.

Environment Canada, www.tor.ec.gc.ca/airg
Roger Street, (416) 739-4271,
roger.street@ec.gc.ca

Adapting to Climate Change Impacts on the Landscape
This program, a combined government, university and industry effort, is assessing how climate change could affect selected aspects of the Canadian landscape in order to help decision-makers determine their adaptation options. Current topics include: sea level rise impacts on the coasts of the Western Arctic and Prince Edward Island, landslides in the Rocky Mountains, slope stability implications for pipelines across Canada, drought frequency on the Prairies, permafrost thaw and impacts on infrastructure in the Northwest Territories, and flooding in the Red River Basin.

Natural Resources Canada,
http://sts.gsc.nrcan.gc.ca/page1/clim/
Paul Egginton, (613) 992-2451,
pegginto@nrcan.gc.ca

Agro-Climate Monitoring and Information Transfer
The unit will be developing a long-term agro-climate strategy for the Branch. The scope of activities, to take place over the next three years, include analyzing



alternative long-term strategies for drought monitoring, reporting and responses, and the application of long range climate forecasts to prairie agriculture; and recommending a preferred course of action to PFRA senior management. The group's activities will also include identification of climate trends and their impact on long-range climate forecasts, as well as management of the Branch's on-going drought monitoring and reporting activities.

Prairie Farm Rehabilitation Administration (PFRA)
www.agr.ca/pfra/pfintroe.htm
www.agr.ca/pfra/pfheade.htm#ac
Brian Abrahamson, (306) 780-8875,
abrahamsonb@em.agr.ca
Alan Stewart, (780) 495-3308,
stewarta@em.agr.ca
Ted O'Brien, (306) 780-6000, obrient@em.agr.ca

Feasibility of Identifying Heat Effects and Mortality in Canadian Seniors as a Basis for Effective Climate Change Risk Management and Adaptation
The objective of the research is to examine the effects of heat and related mortality rates in Canadian seniors. The data collected will serve as a basis for effective climate change risk management and adaptation capabilities.

Health Canada,
Wendy Thompson, (613) 941-1282,
wendy_thompson@hc-sc.gc.ca

Fire Protection – Adaptation Responses to Climate Change
This project aims to improve Canada's fire and insect prediction capabilities and devise improved options and strategies to adapt and respond to future fire conditions.

Natural Resources Canada,
http://nofc.cfs.nrcan.gc.ca/climate/
Brian Stocks, (705) 759-5740 ext. 2181,
bstocks@nrcan.gc.ca

Implications of Climate Change for Canada's Forest: Climate Change Research
This program aims to improve Canada 's understanding and prediction of the impacts of climate change on our forest ecosystems, and develop forest management options and responses for adapting and responding to these impacts.

Natural Resources Canada,
http://nofc.cfs.nrcan.gc.ca/climate/
Robert B. Stewart, (613) 947-9014,
rstewart@nrcan.gc.ca

International Experts Workshop Held in Relation to the Development of International Guidelines for Assessing the Health Impacts of Climate Change
The World Health Organization and the Government of Canada will jointly produce international guidelines for the development of health impacts assessment methodologies in relation to climate change. The guidelines will increase the ability of Canada and other signatory countries of the United Nations Framework Convention on Climate Change (UNFCCC) to assess the health impacts of climate change within their own country by providing methodologies that will enable valid comparisons of impact assessment results and optimum national and international health risk management.

Health Canada, World Health Organization (WHO),
Dieter Riedel, (613) 952-7810,
dieter_riedel@hc-sc.gc.ca

British Columbia

Agriculture – Identification of Agricultural Soil Carbon Sequestration Potential in BC
British Columbia is researching to enable development of a policy for the accounting of agricultural soil sinks. Alternative cropping practices will be identified for areas with a potential to increase soil organic matter. Broad costs for alternative practices and potential carbon credit value will be estimated.

Rob Menes, (250) 356-0191,
robert.menes@gems1.gov.bc.ca

Fisheries – Adaptation in BC's Fisheries Sector
British Columbia is researching climate change impacts on fish and fish habitat; establishing gene banks to protect diversity of fish populations affected by climate change; cooperating with other agencies to restore fish habitat; adopting technology and techniques for selective fisheries; developing and diversifying new fisheries; and communicating with professionals and the public. BC's *Fish Protection Act* and related regulations protect in-stream flows for fisheries and riparian vegetation, helping to mitigate climate change impacts.

www.gov.bc.ca/fish/
Bob Williams, (250) 356-0830,
bob.williams@gems4.gov.bc.ca

Alberta

Alberta Agricultural Research Institute
The Alberta Agricultural Research Institute funds a variety of agricultural research programs, a number of which may have greenhouse gas benefits. The institute's goals are to improve effectiveness in research through collaboration of agencies and researchers; enhance industry competitiveness, profitability and sustainability; promote application of research results by industry; and increase investments in and recognition of research.

www.aari.ab.ca
Ralph Christian,(780) 422-1072,
ralph.christian@gov.ab.ca

Calgary Landfill Design Project
Alberta Environment is a partner with the City of Calgary and the University of Calgary in a project to study landfill designs for the control of landfill gas emissions (including methane). The $50,000 project involves the building of two experimental landfill cells for studying lining/capping materials for landfills.

Raymond Wong, (780) 427-0820,
raymond.wong@gov.ab.ca

Prairie Soil Carbon Balance Research Study
Alberta Agriculture, Food and Rural Development is one of a number of partners supporting a multi-year research study to better understand soil carbon dynamics. The purpose of the study is to develop scientifically sound methods to assess changes in soil carbon based on management practices. This three-year project is being conducted in two phases. Phase I involves a relative comparison of management practices at selected long-term sites for their ability to sequester carbon using soil organic carbon quantity and quality indicators. Phase II of the project involves the Landscape Extrapolation-Modeling aspect of the study.

www.agric.gov.ab.ca
John Keng, (780) 427-3770, john.keng@gov.ab.ca

Research on the Role of Forests in the Global Carbon Cycle
The Government of Alberta funds the Foothills Model Forest and the Sustainable Forest Management Network to a combined total of $2 million per annum. A portion of this funding supports research into the carbon dynamics of forests and other landscapes of the boreal forest. The Foothills Model Forest has compared the impact of wildfire disturbance and wood products manufacture on the sequestering of carbon.

www.env.gov.ab.ca
Cam McGregor, (780) 422-4571,
cam.mcgregor@gov.ab.ca

Saskatchewan

Climate Change and Fragmented Prairie Biodiversity: Prediction and Adaptation
A large number of terrestrial and aquatic species on the highly fragmented prairies are at great risk of extirpation through the effects of climate change. The assumption has been that they will move and that others will take their place. This study will provide models of probable adaptation of selected prairie taxa to climate change, and will describe and evaluate possible human responses to those changes in biodiversity.

Kevin Murphy, (306) 787-2941,
kevin.murphy.erm@govmail.gov.sk.ca

A Framework for Assessing Climate Change Adaptation Options for the Forestry Sector in the Prairie Provinces
This graduate student project, funded by the Prairie Adaptation Research Cooperative (PARC) through the University of Saskatchewan, will develop a framework for identifying ways in which forest companies can adapt to climate change impacts through modifications to their Sustainable Forest Management system.

www.parc.ca
Mark Johnston, (306) 953-2491,
johnston@derm.gov.sk.ca

Genetics and Breeding (plant and livestock)
The goal of this program is to improve crop and livestock genetics to reduce inputs per unit of output. Programs are focused on improvements such as increased yield (gain in livestock), improved disease/pest resistance, and improved nutrient uptake (feed efficiencies in livestock).

www.agr.gov.sk.ca
Ken Panchuk, (306) 787-0556,
kpanchuk@agr.gov.sk.ca

Multi-Jurisdictional Cooperation on Northern Climate Change impacts
Saskatchewan Environment and Resource Management is working with Alberta Environment, Manitoba Conservation Department, Nunavut, the Northwest Territories, Yukon, and Natural Resources Canada and

Environment Canada to develop joint project to priorize research on climate change impacts in Northern Canada.

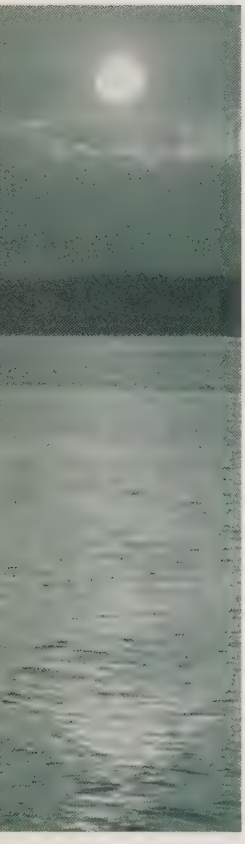
Ron Zukowsky, (306) 787-6285,
ron.zukowsky.erm@govmail.gov.sk.ca

Prairie Adaptation Research Cooperative (PARC)
The Prairie Adaptation Research Cooperative (PARC), established under the Climate Change Action Fund, provides funding for targeted applied research to study adaptation to changes in climate on the Prairies and to better understand the impacts of climate change. PARC will coordinate and encourage collaborative research among sectors and disciplines, and, through the training of new graduates, will act as a focal point for the professional development of researchers in this emerging field of study.

www.gov.sk.ca/enermine
Malcolm Wilson, (306) 787-2618,
malcolm.wilson@sem.gov.sk.ca

Vulnerability of the Western Canadian Boreal Forest to Climate Change
This project will determine the vulnerability of the western boreal forest to climate change in terms of insect/disease outbreaks, frequency and intensity of forest fires and impacts of moisture stress. The focus will be on working with forest industry in identifying these impacts at the Ecodistrict level in ways that are relevant to their operations and planning horizons. Funding is from the Climate Change Action Fund, Impacts and Adaptation Component.

http://sts.gsc.nrcan.gc.ca/adaptation/main.htm
Mark Johnston, (306) 953.2491,
johnston@derm.gov.sk.ca



CLIMATE CHANGE ACTION FUND — SCIENCE, IMPACTS AND ADAPTATION

The Climate Change Action Fund, an initiative of the Government of Canada, has invested $15 million over three years in research that will advance our knowledge of the magnitude, rate and regional distribution of climate change and its impacts on Canada. This will permit us to better estimate the risks of climate change. The program has two components, one focusing on science, and one on impacts and adaptation.

Science

Research into the science of climate change has focused on several key areas identified through a national consultation process: climate model improvements; greenhouse gas sources and sinks, climate monitoring, arctic climate system research and monitoring, climate change scenarios, and climate and weather extremes. Scientists from federal and provincial governments, universities and the private sector have all participated in this program. A selection of projects initiated over the past year is presented below.

Environment Canada
Rob Cross, (819) 997-3840, rob.cross@ec.gc.ca

- **Climate Scenarios for the Canadian Impacts Community: Identifying the Needs** has helped to identify and provide the climate scenarios that would meet the needs of the climate impacts research community in Canada. This, in turn, will help provide all regions and sectors of Canada with climate model results that are in a form useful for their specific applications. This work is best done through a partnership between researchers working on climate models and those working on the impacts of climate change. The project will also result in the development of a needed national capacity in this area so that similar information and advice will continue to be available. This initiative has links to similar activities internationally.

  Environment Canada
  Roger Street, (416) 739-4271,
  roger.street@ec.gc.ca
  Doug Whelpdale, (416) 739-4869,
  doug.whelpdale@ec.gc.ca

- **Developing a National Upscaling Strategy for Carbon Budgets of Canada's Forest Ecosystems Using Remote Sensing, Tower Flux and Inventory Data** will lead to a better understanding of the role of Canadian forests in addressing climate change, by improving national estimates of how much carbon is stored in Canada's forests. This project will combine the measurement of carbon dioxide exchanged between the ecosystem and the atmosphere, obtained from tower-based instruments, with satellite information on what types of vegetation are in the forests. The use of satellite imagery will also allow scientists to develop models of the amount of carbon in our forests, to assist in predicting how forests are responding to climate change.

Canada Centre for Remote Sensing,
Natural Resources Canada
Jing M. Chen, (613) 947-1266,
jing.chen@ccrs.nrcan.gc.ca

- **Establishing Approximations for Sloping Bottom Boundary Layers to be Incorporated into Ocean General Circulation Models** will use modeling studies to understand and quantify the important mixing processes of water in the oceans. Once researchers understand the main processes that occur on a small scale, they can calculate the mixing processes for major continental shelves and deep-ocean ridges.

  Fisheries and Oceans Canada
  Ming Li, (250) 363-6343,
  lim@pac.dfo-mpo.gc.ca

- **Improving the Approximation of Ice Cloud Radiation Processes in Canadian Climate Centre Global Climate Models** is addressing how to improve the portrayal of processes associated with ice clouds in regional and global models of the climate system. "Ice clouds" are clouds that exist in environments cold enough for water to freeze, and these clouds regularly cover about 30% of the globe. The ice crystals making up the ice clouds come in a variety of sizes and shapes — a feature that makes them and their effects on solar and terrestrial radiation more difficult to represent in climate models. Findings from this project will be included in the Canadian Climate Centre Global Climate Model, and the researchers will also investigate the consequences for climate simulations.

  Atmospheric Science Program, Department of Oceanography, Dalhousie University
  Qiang Fu, (902)-494-6448, qfu@atm.dal.ca

- **Improving Approximations of Land Surface Snow Processes for Canadian Climate Models** will test approximations for snow cover against observational snow cover data from various Canadian sites. Snow cover is an important part of the climate system and at present is not well represented in climate models. The project will also investigate the phenomenon of blowing snow, which is not currently considered in models. As a result, the climate model will represent snow cover more accurately. It will also lead to more precise predictions of snow cover and other climate variables.

  Environment Canada
  Diana Verseghy, (416) 739-4422,
  diana.verseghy@ec.gc.ca

- **Improving the Representation of the Interaction between Clouds and Radiation in Canadian Climate Models** will develop, test and implement new radiative transfer algorithms in the Canadian Global Climate Change Model (GCM). These algorithms address the interaction between clouds and radiation, both solar and terrestrial, at scales unresolved by the GCM. The algorithms will aid in the production of a more realistic climate model, thereby helping scientists simulate climatic change caused by increased concentrations of greenhouse gas emissions and atmospheric aerosol.

  Environment Canada
  Howard Barker, (416) 739-4909,
  howard.barker@ec.gc.ca

- **Modelling Regional Climate Changes in the Canadian Inland Seas: The Gulf of St Lawrence and Hudson Bay** will advance the development of a regional ice-ocean climate model component for the Eastern Canada Regional Climate Model by producing regional ice-ocean climate scenarios for these two Canadian inland seas. These scenarios will show what conditions could be like in those areas in the future if carbon dioxide levels continue to increase.

  Fisheries and Oceans Canada
  François J. Saucier, (418) 775-0791,
  saucierf@dfo-mpo.gc.ca

- **Northern Oceans Dimethylsulfide Emissions Models (NODEM)** is aimed at improving our understanding of how naturally occurring sulfur sources (e.g. microalgae) from northern oceans affect climate change. It will also help us predict the effect of climate change on oceanic dimethylsulfide (DMS) production. This issue is important, as it has been hypothesized that a rise in global temperature could foster DMS production, which could partially counter the greenhouse effect.

  Fisheries and Oceans Canada
  Maurice Levasseur, (418) 775-0608,
  levasseurm@dfo-mpo.gc.ca

- **Scaling of Cold Season Land Surface Processes and Its Application to Improving Land Surface Parameterizations in Canadian Climate Models** will improve the way snow-covered land surfaces, particularly at more local scales, are represented in Canadian climate system models. Researchers will conduct modeling studies for snow cover for different regions and

seasons with the aim of better predicting cold season climatic conditions across Canada.

Environment Canada
Kit Szeto, (416) 739-4889, kit.szeto@ec.gc.ca

- **Sulphate Aerosol Forcing in Canadian Climate Models** is conducting research to improve the way in which climate system models represent the processes involving sulphate aerosols in the atmosphere. Sulphate aerosols are solid or liquid particles suspended in the air, and aerosols are produced by both human activities and natural processes. These sulphur-containing substances are important as they cool the atmosphere, thus partially countering the warming effect of greenhouse gases. By understanding the combined effects of greenhouse gases and sulphate aerosols, we will be better able to predict the future climate.

Atmospheric Science Program,
Department of Physics, Dalhousie University
Ulrike Lohmann, (902) 494-2324,
ulrike.lohmann@dal.ca

Impacts and Adapation

The Impacts and Adaptation sub-component of the CCAF-SIA provides funding for targeted research to better understand the impacts of climate change on the regions and sectors of Canada, and how we can adapt to these impacts — now and in the future. The Impacts and Adaptation sub-component has also contributed to the development of a national network that brings together government, university and private-sector researchers and stakeholders to address climate impacts and adaptation. A selection of impacts and adaptation projects is presented below.

Natural Resources Canada,
http://sts.gsc.nrcan.gc.ca/adaptation
Pamela Kertland, (613) 943-0650,
pkertlan@nrcan.gc.ca

- **Adaptation of Prairie Cities: The Role of Climate** is assessing alternative urban decision-making models in order to promote adaptation to a range of future climates. The project will examine how four major cities (Edmonton, Saskatoon, Regina and Winnipeg) and four small cities (Brandon, Swift Current, Prince Albert and Grande Prairie) use climate information within their current decision-making processes. The project will also review the climatic sensitivity of key activities and the possible impacts of climate changes. The project involves the Saskatchewan Research Council (City Climate Advisory Group), the Achitectural Association of Saskatchewan, Alberta Environmental Protection, Manitoba Conservation, Saskatchewan Environment and Resource Management, and SaskPower.

Saskatchewan Research Council,
www.src.sk.ca/climatology
Virginia Wittrock, (306) 933-8122,
wittrock@src.sk.ca

Climate Change Environmental Assessment of Agricultural Producers' Investment Strategies in the Montreal Region assesses the extent to which the investment strategies of agricultural producers in the richest agricultural region of Quebec increase, decrease or remain neutral to maintaining or improving these farms' resilience and adaptability to climate change.

Université de Montréal,
http://sts.gsc.nrcan.gc.ca/adaptation/
Pierre André, (514) 343-8051
andrep@ere.umontreal.ca

- **Climate Change, Permafrost Degradation and Infrastructure Adaptation: Community Case Studies in the Mackenzie Valley** is examining sensitivity to the impacts of permafrost degradation in the North under climate warming in order to determine infrastructure needs that include future adaptation measures and strategies. The study is being conducted in the towns of Norman Wells and Tuktoyaktuk in the Northwest Territories. The project also involves Enbridge Pipelines (NW) Ltd, ESSO Resources, and EBA Engineering Consultants.

Natural Resources Canada,
http://sts.gsc.nrcan.gc.ca/adaptation/
Stephen Robinson, (613) 992-0612,
srobinso@nrcan.gc.ca

- **Development of Model Adaptation Strategies to Reduce Health Risks from Summer Heat in Toronto** will help develop short- and long-term climate adaptation strategies for Toronto, including the development of an extensive urban reforestation plan and an effective Heat-Health Watch/Warning System. The published studies will enhance understanding of the potential urban impacts of climate change. The project involves the City of Toronto (Public Health Department), the Toronto Atmospheric Fund, and the University of Delaware.

City of Toronto,
www.city.toronto.on.ca/taf
Philip Jessup,
(416) 392-0271, taf@city.toronto.on.ca

- **Effect of Recent Climate Change on the Early Marine Growth Rates of Juvenile Salmon in the Strait of Georgia** is assessing whether recent changes in plankton dynamics and increases in water temperature, which result from climate change, have combined to reduce the growth rates of juvenile salmon in the Strait of Georgia. The Straight of Georgia is one of the most productive marine ecosystems in Canada and serves as a critical nursery area for juvenile salmon.

  University of British Columbia,
  www.eos.ubc.ca/
  John Dower, (604) 822-2496,
  jdower@eos.ubc.ca

- The **Prairie Adaptation Research Cooperative** is an interdisciplinary research network established to facilitate coordination and adaptation research on the Prairies, build research capacity and improve the understanding of the potential impacts of climate change on Canadian prairie provinces. The cooperative also conducts research necessary to develop appropriate adaptation strategies.

  Natural Resources Canada, Governments of Alberta, Saskatchewan, Manitoba, www.parc.ca
  Don Lemmen, (613) 992-5861,
  dlemmen@nrcan.gc.ca

- **Sea Level Rise and Climate Change: Impacts and Adaptation Needs – Prince Edward Island: A Case Study** is using leading-edge technologies, including LIDAR mapping, to obtain detailed information about how changes in sea level, storm surges, waves and sea ice will affect the coastal zone of Prince Edward Island. The project forms the basis for planned comprehensive research in Atlantic Canada and the development of adaptation strategies to cope with sea level rise. The project involves Dalhousie University, the Government of Prince Edward Island (Department of Technology and Environment), and the Institute for Catastrophic Loss Reduction.

  Environment Canada, Natural Resources Canada, Fisheries and Oceans Canada
  http://agc.bio.ns.ca/coastweb/pei/index.html
  Martha McCulloch, (902) 426-9200,
  martha.m.mcculloch@ec.gc.ca

  Don Forbes, (902) 426-7737,
  dforbes@nrcan.gc.ca

POLICY DEVELOPMENT

Government of Canada

Canada's Clean Development Mechanism (CDM) and Joint Implementation (JI) Office

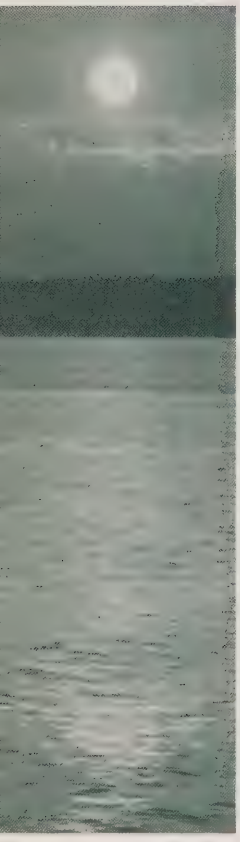
The Government of Canada's CDM and JI Office, established in 1998, is the federal government focal point on the Clean Development Mechanism and Joint Implementation, two project-based mechanisms under the Kyoto Protocol. The Clean Development Mechanism allows Canada to implement greenhouse gas emissions reduction projects in developing countries in order to help Canada meet its Kyoto target. Joint Implementation allows Canada to work with other developed countries to meet Canada's emissions targets through jointly implemented emissions reduction projects.The Office facilitates Canadian participation in the CDM and JI, evaluates and approves project proposals submitted by Canadian entities and assists with host country approval processes, including strategic cooperation agreements with the host countries. It also provides technical guidance to companies participating in the CDM and JI.

Department of Foreign Affairs and International Trade, www.dfait-maeci.gc.ca/cdm-ji/
Sushma Gera, (613) 944-0051,
sushma.gera@dfait-maeci.gc.ca

National Energy Use Database (NEUD) Initiative

This initiative enables the Government of Canada to monitor and evaluate progress towards its goal of limiting greenhouse gas emissions, provide information to support the development of future initiatives, and ensure the development of a base of expertise in the analysis of energy consumption at the end-use level in Canada. The development of energy end-use data includes reviews of existing data, assessment of information needs, expansion of existing surveys or the creation of new ones to meet these data needs, and the establishment of energy end-use data and analysis centres at selected universities across Canada.

Natural Resources Canada,
http://oee.nrcan.gc.ca
Tim McIntosh, (613) 943-2396,
tmcintos@nrcan.gc.ca



Participation in the Development of a National Implementation Strategy on Climate Change
The Government of Canada has worked with provincial and territorial governments, as well as with interested stakeholders including industry, scientists, the business community, non-governmental organizations, and individual Canadians, to build a national implementation strategy to respond to climate change, including Canada's international commitments. Sixteen Issues Tables, involving some 450 experts from multiple perspectives, examined the costs, impacts, and benefits of implementing the Kyoto Protocol and the options open to Canada in developing a climate change strategy. The Analysis and Modelling Group, part of the Issue Table process, used the Issue Tables input to form options for broad policy approaches to meet the climate change challenge. Their work has been the foundation for the development of the National Implementation Strategy and the First National Climate Change Business Plan of measures to implement the strategy.

Climate Change Secretariat,
www.nccp.ca
David Oulton, (613) 943-2669,
daoulton@ccs.gc.ca

British Columbia

Assistant Deputy Ministers' Climate Change Committee
The Assistant Deputy Ministers' (ADMs) Climate Change Committee co-ordinates BC government policy development and program initiatives on climate change. The committee includes ADMs from all provincial agencies affected by climate change or climate change policies.

www.elp.gov.bc.ca/epd/epdpa/ar/climate/
Mark Gillis, (250) 356-5475,
Mark.Gillis@gems8.gov.bc.ca

British Columbia Greenhouse Gas Forum
The BC Greenhouse Gas Forum was initiated in 1997 and comprises representatives of local government, industry, business, labour, environmental groups and other interests. It advises the Minister of Environment, Lands and Parks, and the Minister of Energy and Mines, on climate change policy and facilitates the development and implementation of greenhouse gas reduction measures. Forum reports include *Plan for Early Action* (1998) and *Promising Phase 1 Climate Change Measures* (2000).

www.elp.gov.bc.ca/epd/epdpa/ar/climate/
Laura Porcher, (250) 356-0664,
laura.porcher@gems1.gov.bc.ca

Green Economy Working Group
The Green Economy Working Group is a ministerial committee of cabinet that supports BC businesses and communities in a transition toward a more sustainable local and global economy. This ministerial committee is overseeing the Green Economy Initiative, which includes the development and implementation of a number of measures that will result in greenhouse gas reductions.

www.gov.bc.ca/ges/
Green Economy Secretariat, (250) 387-1949,
ges.feedback@gems4.gov.bc.ca

Greenhouse Gas Mitigation Guidelines under BC's Environmental Assessment Process
British Columbia is initiating a consultation process to review the potential of establishing guidelines for greenhouse gas mitigation plans for projects reviewed under BC's Environmental Assessment Process. Under the draft guidelines, plans would be submitted and approved as part of the overall project approval.

Warren Bell, (250) 387-4773,
warren.bell@gems8.gov.bc.ca

Ozone Depleting Substances Legislation
Amended in 1999, the BC *Ozone Depleting Substances and Other Halocarbons Regulation* establishes stricter controls on ozone depleting substances and includes controls on halocarbons (HFCs), of which most are potent greenhouse gases.

www.elp.gov.bc.ca/epd/epdpa/ar/ozone/index.html
John Sutherland, (250) 387-9936,
John.Sutherland@gems6.gov.bc.ca

Urban Areas – Assessment of Options for Reducing Greenhouse Gases (GHG) in the Greater Vancouver Region
An assessment of options to reduce air pollutants in the Greater Vancouver region is being conducted by the Greater Vancouver Regional District and BC Environment. The work will include an estimate of greenhouse gas reductions, reductions of other air contaminants, estimated costs of reduction, and

associated benefits, including improvements in air quality and public health impacts. This work has future extensions to assessments for the Lower Fraser Valley and other urban regions.

Hu Wallis, (250) 356-0345,
hu.wallis@gems5.gov.bc.ca

Alberta

Participation in the Development of the National Implementation Strategy

The Government of Alberta is actively involved in the National Implementation Strategy for climate change. The Alberta and federal governments are co-chairs of the National Climate Change Process. Alberta stakeholders have been active participants in all 16 national tables dealing with climate change issues. Approximately 50 Albertans from government, industry and non-governmental organizations are members of all of the 16 National Climate Change Process Issue Tables and Working Groups.

www.nccp.ca
Bob Mitchell, (780) 422-8464,
bob.mitchell@gov.ab.ca

Saskatchewan

Greenhouse Gas Initiatives in Saskatchewan Agriculture

This initiative will summarize the currently available information on greenhouse gas and carbon sequestration in Saskatchewan agriculture and review and discuss policy options for emission abatement. It will also identify various economic scenarios for Saskatchewan agriculture industry and producers and provide options and recommendations.

Ken Panchuk, (306) 787-0556,
kpanchuk@agr.gov.sk.ca

Saskatchewan Stakeholder Advisory Committee on Climate Change (SSACCC)

This committee provides a forum for discussion of climate change issues by affected businesses, industry, non-governmental organizations and government agencies.

eru@cas.uregina.ca
Dan McFadyen, (306) 787-2523,
dan.mcfadyen@sem.gov.sk.ca
Ron Zukowsky, (306) 787-6285,
ron.zukowsky.erm@govmail.gov.sk.ca

Nova Scotia

Climate Change Human Resources Development Initiative

The goal of this initiative is to develop highly qualified personal in the areas of climate change and greenhouse gas management in the agricultural sector. Two, three-year positions will be created: 1) Climate Change Research Chair and 2) Environmental Management Research/Outreach Coordinator. Work will include research into carbon storage in soils and public education and outreach on climate change to the agricultural sector.

Robert Gordon, (902) 893-6561,
gordonrj@gov.ns.ca

Nova Scotia Climate Change Strategy

The Government of Nova Scotia is producing a climate change strategy for the province, including a list of suggested early actions. Consultations with stakeholders were held at six locations in Nova Scotia in November 1999. An Interdepartmental Committee on Climate Change was formed to develop a strategy using the results of the consultation process and other appropriate resources.

www.gov.ns.ca/natr/climate
George Foote, (902) 424-8168, gffoote@gov.ns.ca

Northwest Territories

Development of a Strategy to Control Greenhouse Gas Emissions in the Northwest Territories

The initiative will result in the development of a strategy to control greenhouse gas emissions in the Northwest Territories (NWT) by March 31, 2001. Specific objectives to be accomplished in the strategy include increasing awareness in the NWT of the issue of global climate change and the need to control greenhouse gas emissions; engaging all northerners including government, non-government, industry, and the general public, to take action to control greenhouse gas emissions; and identifying and implement achievable and practical actions that can be undertaken immediately, as well as longer-term actions which will result in future, sustained reductions in greenhouse gas emissions in the NWT

www.ssimicro.com/~ghgs/index.html
Lloyd Henderson, (867) 873-7654,
lloyd_henderson@gov.nt.ca

Nunavut

Development of a Strategy to Control Greenhouse Gas Emissions in Nunavut

The purpose of this program is to develop a strategy to control greenhouse gas emissions in Nunavut. The process would include a broadly based stakeholder consultation approach to obtain input from residents in order to develop options, priorities, and recommendations for government policy and programs, and also for recommendations from Institutes of Public Government, corporations, business, stakeholders, and the public. Development of the strategy will increase awareness in Nunavut of the issue of global climate change and the need to control greenhouse gas emissions; encourage all northerners (government, non-government, industry, general public) to voluntarily take strong action to control greenhouse gas emissions; identify and implement achievable and practical actions that can be undertaken immediately, as well as longer-term actions which will result in future, sustained reductions in greenhouse gas emissions, taking into consideration the economic, environmental and social costs and benefits; and identify economic opportunities that may arise from the use of cleaner, more efficient equipment and technology.

Earle Baddaloo, (867) 975 5910,
ebaddaloo@gov.nu.ca

DOMESTIC EMISSIONS TRADING

Government of Canada

Baseline Protection Initiative (BPI)

This initiative, scheduled for launch in late 2000, will allow greenhouse gas emitters to register eligible actions they have taken since 1990 so that the emissions reductions realized from these actions will be included or "protected" in their emissions baseline.

Natural Resources Canada,
http://oee.nrcan.gc.ca
Marie Maher, (613) 947-2076,
mamaher@nrcan.gc.ca

Greenhouse Gas Emission Reduction Trading Pilot (GERT)

This multi-stakeholder initiative involving federal, provincial and local government agencies, industry, and environmental groups, is pilot-testing some of the key elements of project-based emission credit trading for greenhouse gas emissions in the Canadian context. The pilot's objectives are to inform policy development on emission trading by reviewing emission reduction projects and trades; develop approaches, tools, and methodologies to support a greenhouse gas trading market; and provide practical experience with emission reduction trading for Canadian companies, governments and other stakeholders.

Natural Resources Canada,
www.gert.org/whatsnew
Warren Bell, (250) 387-4773,
warren.bell@gems8.gov.bc.ca

British Columbia

Greenhouse Gas Emission Reduction Trading Pilot

The Government of British Columbia is spearheading the national Greenhouse Gas Emission Reduction Trading (GERT) Pilot Project to test the effectiveness of emission trading to decrease greenhouse gas emissions. The GERT Pilot is recognized internationally as being on the leading edge of finding practical approaches to emission trading. The GERT pilot has been extended to December 31, 2001.

www.gert.org/index.htm
Warren Bell, (250) 387-4773,
Warren.Bell@gems8.gov.bc.ca

Alberta

Greenhouse Gas Emission Trading (GERT)

Alberta is a member of the voluntary baseline and credit greenhouse gas emission trading pilot, established to learn about the feasibility of emission reduction credit trading in Canada and to encourage early emission reduction projects. The Alberta government encourages Alberta energy companies to participate in the GERT pilot to strengthen their original commitment to the Voluntary Challenge and Registry Inc. and to voluntary greenhouse gas emission reductions. Twelve such projects have been posted to the GERT Web site, totaling more than 792,000 tonnes of annual CO_2 emission reductions.

www.gert.org
Don Macdonald, (780) 422-7872,
don.macdonald@gov.ab.ca

KEFI-Exchange
KEFI-Exchange Inc., a privately owned Alberta company, operates Canada's first internet based electronic greenhouse gas emission reductions exchange. The KEFI-Exchange offers emission reductions through an exchange service to a broad group of affected parties. Using the KEFI-Exchange, parties are able to buy and sell greenhouse gas emission reductions that are surplus to the needs of others. These emission reductions can then be applied towards an entity's individual commitment to reduce greenhouse gas emissions.

www.kefi-exchange.com
Brock John, (403) 210-2144,
bjohn@kefi-exchange.com

Saskatchewan

Saskatchewan Environment and Resource Management (SERM)-SaskPower Carbon Offset Agreement
Through this initiative, 5 million trees will be planted in the provincial forest. The resulting forest carbon reserves will generate carbon credits by removing areas of provincial forest from harvesting, establishing ecological reserves, and reforesting areas harvested in the past. SERM is transferring these credits to SaskPower in exchange for funding to carry out the reforestation. Credits equivalent to approximately 6 million tonnes of carbon will be transferred.

www.gert.org
Tony Baumgartner, (306) 787-3435,
tony.baumgartner.erm@govmail.gov.sk.ca
Mark Johnston, (306) 953-2491,
johnston@derm.gov.sk.ca

INTERNATIONAL INITIATIVES

Government of Canada

APEC Energy Working Group (EWG)
This working group is the primary vehicle for multilateral energy cooperation and information sharing with the Asia Pacific region (including China). EWG seeks to enhance understanding of policy issues and build the capacity of developing economies to implement energy policies consistent with sustainable development. Expert groups deal with energy efficiency and conservation, "clean" use of fossil fuels, new and renewable energy technology; and energy data and outlook, including CO_2 inventories and indicators.

Natural Resources Canada,
www.apecenergy.org.au
Gil Winstanley, (613) 996-2993,
gwinstan@nrcan.gc.ca

Canada Climate Change Development Fund (CCCDF)
The goal of the Canada Climate Change Development Fund is to contribute to Canada's international objectives in climate change by promoting activities in developing countries that seek to address the causes and effects of climate change while at the same time contributing to sustainable development and poverty reduction. The focus of the CCCDF will be on technology transfer and related activities in four programming areas: emission reduction, carbon sequestration, adaptation and core capacity building for climate change.

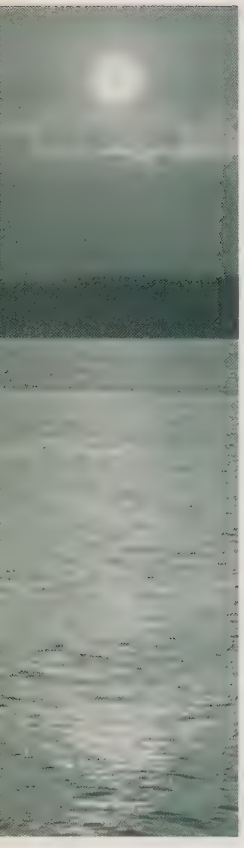
www.acdi-cida.gc.ca
Susan Pereverzoff, (819) 953-2182,
susan_pereverzoff@acdi-cida.gc.ca

Canada / European Union Science and Technology (S&T) Agreement
This broad agreement covers all fields of science and technology including energy and enables Canadian researchers from either the public or private sectors to submit proposals for participation in the European Union's Framework Research and Development programs. The agreement also provides opportunities to participate in basic and applied research in non-nuclear energy.

Natural Resources Canada
Kim Smith, (613) 995-5299,
ksmith@nrcan.gc.ca

Climate Change Compendium
The Climate Change Compendium is being undertaken by the Climate Change Knowledge Network, coordinated by the International Institute for Sustainable Development. The Compendium will present a framework for analyzing climate-related information; a guide to implementation of the United Nations Framework Convention on Climate Change (UNFCCC) and Kyoto Protocol, and a teaching tool for capacity building workshops and educational courses.

http://iisd.ca
Susan Pereverzoff, (819) 953-2182,
susan_pereverzoff@acdi-cida.gc.ca



Climate Change Knowledge Network
The Climate Change Knowledge Network (CCKN) is comprised of 14 research institutes from developing, developed and transitional countries. It is coordinated by the International Institute for Sustainable Development. The goal of the CCKN is to enhance the capacity of developing and developed countries to shape an effective, sustainable and equitable climate change regime.

www.iisd.ca
Susan Pereverzoff, (819) 953-2182,
susan_pereverzoff@acdi-cida.gc.ca

Hemispheric Energy Initiative (HEI)
This initiative is the primary vehicle for multilateral energy cooperation and information sharing with Latin America. Under this initiative, Canada co-chairs the Climate Change Working Group with Argentina, promoting information exchange and the identification of areas for future cooperation linked to energy-efficient buildings and equipment, including the development of energy standards.

Natural Resources Canada,
www.americasenergy.org
Teresa Marty, (613) 996-8141,
tmarty@nrcan.gc.ca

Intergovernmental Panel on Climate Change (IPCC)
The Intergovernmental Panel on Climate Change was created in 1988 by the United Nations Environment Program and the World Meteorological Organization to assess the available scientific information and the potential impacts and to formulate strategies to respond to climate change. More than 30 Canadian scientists have contributed to the IPCC's Third Assessment Report (scheduled for release in 2001), which will provide a comprehensive and up-to-date assessment of the scientific, technical, and socio-economic dimensions of climate change; and to the Special Reports on carbon sinks, technology transfer, greenhouse gas inventories, and emissions scenarios (completed in 2000).

www.ipcc.ch
Joan Masterton (Environment Canada),
(416) 739-4321, joan.masterton@ec.gc.ca
Paul Samson (Natural Resources Canada),
(613) 996-7631, pasamson@nrcan.gc.ca

International Energy Agency (IEA)
The IEA, the primary multilateral forum dealing with global energy issues, emphasizes climate change policy options and their impacts, and develops International Collaborative Research and Development agreements. Under the IEA, Canada is participating in 23 Implementing Agreements with a climate change or environmental science and technology component.

Natural Resources Canada, www.iea.org
Gil Winstanley (international energy),
(613) 996-2993, gwinstan@nrcan.gc.ca
Graham Campbell (implementing agreements),
(613) 995-8860, gcampbel@nrcan.gc.ca

Memoranda of Understanding (MOU)
Canada has memoranda of understanding with several countries on issues relevant to climate change.

- The MOU with the **Chinese Ministry of Water Resources** involves cooperation in small hydropower research and development, training of technical personnel and technology transfer.

  Natural Resources Canada
  Claude Barraud, (613) 996-6087,
  cbarraud@nrcan.gc.ca

- The MOU with the **Korean Ministry of Commerce, Industry and Energy (MOCIE)** established a Canada-Korea Joint Working Group (JWG) on Greenhouse Gas Reduction that seeks to promote discussion and information exchange, and facilitate bilateral cooperation on climate change. The MOU also provides opportunities for joint projects under the Clean Development Mechanism (CDM)/Joint Implementation (JI) mechanisms of the Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC), particularly in the area of energy.

  Natural Resources Canada
  Jean Cooper, (613) 996-6474,
  jcooper@nrcan.gc.ca

- The MOU with the **Korean Institute of Energy Research (KIER)** provides for cooperation on energy and environmental research and development, and on technology transfer.

  Natural Resources Canada
  Martin Aubé, (613) 996-6004,
  maube@nrcan.gc.ca

- The MOU with the **Mexican Secretariat of Energy** provides for cooperation to increase energy efficiency in both countries and encourage use of alternative energy. The MOU also enhances trade, investment, technical and other exchanges with respect to energy-efficient products, energy management services and alternative energy goods and services.

  Natural Resources Canada
  Nick Marty, (613) 996-6629,
  nmarty@nrcan.gc.ca

- The MOU with the **United States Department of Energy** provides for cooperation in research and development in all areas of non-nuclear energy research and development, including energy efficiency in buildings, industry and transportation, renewables and cleaner fossil fuels. Cooperation is effected through Implementing Arrangements.

  Natural Resources Canada
  Hamid Mohamed, (613) 995-5782,
  hmohamed@nrcan.gc.ca

Canadian International Development Agency (CIDA) Activities Related to Climate Change

The Canadian International Development Agency is the lead agency responsible for delivering Canada's official development assistance (ODA) and official assistance (OA) programs. The primary objective of the ODA program is to support sustainable development in developing countries in order to reduce poverty and to contribute to a more secure, equitable and prosperous world. The OA program supports democratic development and economic liberalization in Central and Eastern Europe and the former Soviet Union, by building mutually beneficial partnerships. Working with partners in the private and public sectors in Canada and in developing countries and with international organizations and agencies, CIDA supports projects and programs in more than 100 countries around the world. Much of CIDA's programming contributes, directly or indirectly, to global climate change efforts. The following is a summary of CIDA aid projects that contain a climate change element.

For information on all of these initiatives, please e-mail climate_secretariat@acdi-cida.gc.ca

Emissions Reduction

Bangladesh

Environmental Management Program – This project aims to strengthen the institutional capacity of Bangladesh's Department of Environment. Activities include establishing environmental management demonstration areas and implementing environmental initiatives which can help reduce greenhouse gas emissions, e.g., a demonstration project targeting the conversion of rickshaws to natural gas.

Bolivia

Oil and Gas Project Phase II – This project has assisted Bolivia in building the capacity to develop environmental regulations and guidelines and contributed to increases in gas reserves which will help reduce CO_2 emissions in Bolivia and Brazil.

Brazil

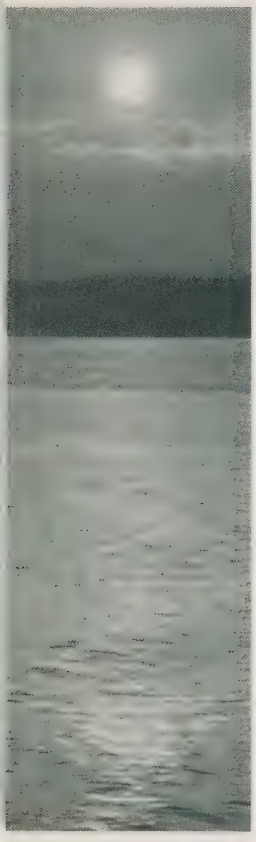
Electricity Energy Efficiency Project – Through this project, the Brazilian National Energy Efficiency Program (PROCEL) is building its capacity by drawing on successful Canadian models of demand-side management to change consumer patterns of electricity consumption and to improve efficiencies, in order to slow the expansion of electrical energy consumption.

Central America

Regional Electrical Energy Project – This project supports the reform of the electrical sub-sector and enhances regional collaboration in the exchange of electricity. Its activities include increasing efficiencies, reducing losses, introducing demand side management, helping develop strategies for increased use of hydro electric resources and providing support for an initiative to determine the feasibility of importing natural gas into the region. The project builds the capacity of the region to effectively manage its energy resources. The outcome of these initiatives is the reduction of the level of CO_2 emissions.

China

Canada-China Cooperation Project in Cleaner Production – In this project, emphasis is placed on pollution prevention, conservation of raw materials and energy, eliminating toxic raw materials, etc. by strengthening institutional capacity to implement cleaner production. In collaboration with China's State Economic and Trade Commission and national Environmental Protection Agency, the project will



strengthen the institutional capacity of these institutions to promote the implementation of Cleaner Production (CP).

Canada/China Jiangsu SME Applied Management and Environment Project – This projects seeks to build management and environmental/business capacity for Small and Medium-sized enterprises through increasing awareness and demonstration projects around waste minimization, cleaner production (CP), etc. The project will also support sectoral linkages and information exchange between Canadian industries and Jiangsu village enterprises in the focus sectors of the project (initially chemical and metal working).

Comprehensive Transport Management Training – This project is designed to strengthen China's managerial, planning and operational practices in the transportation sector, resulting in decreased greenhouse gas emissions from this sector.

Energy Efficiency in Building Projects – This project aims to build the capacity of China's Ministry of Construction to develop energy efficiency standards for buildings, based on Canadian technology, thereby reducing greenhouse gas emissions. The objective of this project is to improve atmospheric quality and reduce energy consumption through rationalized energy use in the civilian building sector.

Oil and Gas Technology Transfer Programme – This seven-year project assists in the optimal recovery of China's oil and gas resources by upgrading the capacity of selected petroleum institutions and research centres. Canadian experts were sent to China to conduct specialized courses in various aspects of oil and gas engineering, and selected Chinese experts were sent to Canada for the latest training in oil and gas technology used in Canada.

Strategic Energy Planning for Southern China – This project transfers appropriate processes and techniques to build capacity in China for developing a comprehensive strategy to provide power and coal for Southern China within an economically, environmentally and socially sustainable energy management framework.

Sustainable Resource Development – The project aims to ensure that sustainable development of the petroleum resources and to adopt effective measures to protect and improve the environment in petroleum exploration and development (e.g reduce flaring).

Columbia

Energy, Mining and Environment – This project involves strengthening two ministries, Environment and Mines and Energy. Project activities include providing assistance for energy efficiency and conservation, as well as expanded use of natural gas, thereby reducing greenhouse gas emissions.

Costa Rica

Productive Sector Modernization – This project seeks to build capacity for more efficient production in small and medium sized industries, with resulting lower greenhouse gas emissions.

Egypt

Electricity Sector Reform Special Institutional Support Program – This project aims to support reform of the energy sector in Egypt and encourage greater efficiency, through capacity building of local authorities to reduce electricity losses.

Guinea

Energy Sector Program Planning – This project supports the development of energy sector programming and training through the development assistance program.

Haiti

Create a Model Electrical Utility at Jacmel (part of Technical Assistance to EDH-Phase II) – The project is creating the first electrical utility which will operate with low losses in Haiti. This is being achieved mainly through training and development of the electrical utilities staff.

India

Boiler Emission Upgrade – This project aims to increase the capacity of Indian stakeholders through increased awareness of, and means to introduce viable technology to revamp old and failing power plans using Circulating Fluidized Bed technology (CFB).

Canada Energy Efficiency Project – This project builds Indian capacity to promote environmentally sound development through public and corporate policy-making and cooperation in the fields of energy efficiency and greenhouse gas emissions.

Canada-India Rural Energy – This project aims to increase the utilization of alternative energy technologies among poor households in India. It also seeks to strengthen the capacity of a network of non-

governmental organizations to deliver energy-related activities. An educational component of the project includes the development of curricula related to energy for secondary schools.

Chamera Hydroelectric Project – This project seeks to upgrade the capacities of the National Hydroelectric Power Corporation to design and construct a 540 mW hydroelectric dam.

CII Environmental Management Programme – This project is designed to improve the capacity of the Confederation of Indian Industry's Environmental Management Division to participate in, raise awareness of, and promote cooperation in the development of environmental policies for industry.

Energy Infrastructure Services Project – This project will strengthen the capacity of the Indian government and Central Electricity Research Commission in the areas of organizational restructuring and policy reforms required to improve the efficiency and environmental management in the energy sector in two states.

IDUKKI Dam Project – This project aims to increase the availability and efficiency of electricity in Keralla State through reduction of energy losses in the transmission and distribution systems.

Kerala State Electricity Board Systems Enhancement Project – This project aims to increase the availability of electricity in Kerala State in part through reduction of energy losses in the transmission and distribution systems. It will also build capacity for operating efficiency related to water and energy-use management.

MOEF Institutional Strengthening – This project will strengthen the capacity of the Ministry of Environment and Forests to address a broad range of environmental issues one of which is converting three-wheel vehicles to natural gas, thereby reducing greenhouse gas emissions.

Latin America/Caribbean

ESMAP Refinery Project – This project is assessing the impact of applying new and cleaner fuel specifications to the refining industry in the Latin American and Caribbean regions. The long term benefits of this project include increased capacity in the refinery industry and improved air quality and reduced emissions.

Pakistan

Oil and Gas Programme – This program will strengthen the capacities of government and private sector institutions to manage their oil and gas resources in a more sustainable manner.

Strategic Technical Assistance and Responsive Transfer Fund – This project will support the four programming priorities in Pakistan: energy, social sector, environment and private sector development. This is a Government of Canada-managed fund which responds to requests from the Pakistan government.

WARSEK Rehabilitation Project – This project will assist the Water and Power Development Authority to rehabilitate the WARSEK dam and power station through engineering services, capacity building and technology transfer.

Peru

Petroleum Regulatory Assistance – This project focuses on strengthening the regulation and monitoring of the hydrocarbon sector. With a better regulatory system for the natural gas sector, the use of this resource will replace current fuels resulting in lower emissions.

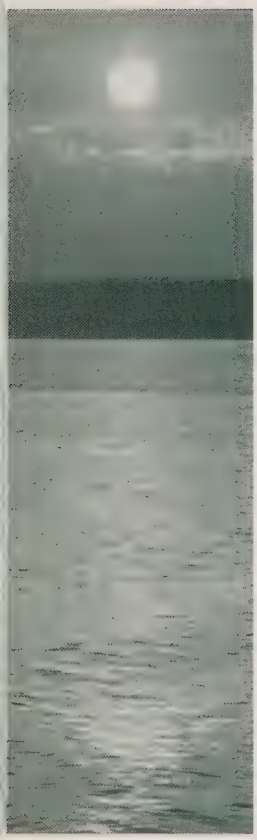
Senegal

OMVS – Impact Assessment and Studies of Electrical Distribution network – The studies will help build capacity by determining the best design for high voltage transmission lines which will improve the efficiency of the distribution network, thereby reducing GHG emissions.

South America

Energy and Environment Project , Latin American Energy Organization (OLADE) – This project is developing capacity within the region to strengthen environmental and regulatory frameworks to allow for sound development and sustainable use of fossil fuel resources.

Environment Project with the Regional Petroleum Companies (ARPEL) – This project promotes and advances standardized approaches to environmental protection in the region. Two components deal with energy efficiency and reducing emissions from vehicles and industries.



Southern Africa

Development Community (SADC) Industrial Energy Management Project – The project is increasing the capacity of consulting engineers, industrial firms and educational institutions in the SADC region to develop industrial energy management programs, undertake energy efficiency projects and offer education/training programs in energy conservation and management.

Tunisia

Project to Transfer Know-How for the Development of Co-Generation Units – To provide ANER and three offices of Tunisian firms with the necessary training to enable them to develop and disseminate co-generation technology as a result of the transfer of technological know-how and the creation of appropriate institutional, tax, economic and legal conditions.

Zimbabwe

Strengthening of Ministry of Environment – This project seeks to strengthen the capacity of the Ministry of Environment to address issues related to energy efficiency and providing assistance to professionals in the environmental sector.

Carbon Sequestration

Argentina

Fire Management Technology (Technology Transfer Fund sub-project) – The British Columbia Forest Service (BC Ministry of Forests) is working with the Argentinean National Fire Management Organization to develop a national infrastructure for the prevention and management of forest fires in Argentina.

Cameroon

Support to environmental protection – The objective of this project is to support civil society in Cameroon in its efforts to implement national forest policy in a manner that is developmentally sustainable.

Sustainable forest management – The objective of this project is to support the implementation of Cameroon's sustainable forest management policies through institutional support to MINEF.

Chile

Chiloe Model Forest (Technology Transfer fund sub-project) – The International Model Forest Network Secretariat, housed at Canada's International Development Research Centre, is working with the Chilean Ministry of Agriculture to enhance its capacity to introduce Canada's "model forest" approach in Chiloé.

China

Kunming Horticulture Exposition – This project provides support for reforestation and enhanced awareness of the importance of trees for environmentally sustainable development in China. It therefore will contribute to protection of carbon sinks.

Costa Rica

Economic Development for Economic Conservation – This project supports ecological conservation through organic agriculture and appropriate ecotourism initiatives. Through improved agricultural practices and conservation of forests, it may contribute to reduced greenhouse gas concentrations in the atmosphere.

Honduras

Broadleaf Forest Development – Through this project, sustainable forest management practices are being introduced to reduce deforestation, improve knowledge about protection and harvesting of forests, and manage land use. The result is the protection of carbon sinks.

India

Tree Growers Cooperative – This project seeks to create a truly sustainable model for village-based community forestry through local capacity building. It will contribute to the protection and enhancement of valuable carbon sinks.

Indonesia

KALTIM Social Forestry Project – This project seeks to build capacity for the establishment of an approach and methodology for community-based forest management which will result in a more sustainable management of carbon sinks.

Jamaica

Green Fund Extension – This project supports community-based initiatives which will contribute to the sound management and conservation of Jamaica's natural resources and improve advocacy and development through more effective networking. Sub-projects have dealt with alternative sources of energy and improved agriculture and agroforestry practices.

South America

Globesar II (RADARSAT) – This project is assisting in resource management by tracking deforestation and reduction of wetlands. This knowledge will contribute to increased capacity of South American decision-

makers to sustainably manage their forest resources. This will result in the protection of these important carbon sinks.

Southeast Asia

Asia Regional Fire Danger Ratings System – This project seeks to increase Asian capacity to develop long-term solutions for responding to and monitoring forest fires in the ASEAN region.

Tree Link – This project helps to build the capacity of the region to manage their forest resources. Specifically, it supports the development and implementation of policies and practices for forest renewal, conservation and protection, in response to the disastrous 1997 forest fire season, recent flooding and increased international pressure through the Kyoto Protocol to address climate change.

Southern Africa

Zambezi Wetlands Conservation – The primary objective of this project is conservation and sustainable use of the Zambezi wetlands. This will be accomplished through information dissemination to decision makers which will help build their capacity to manage these wetlands. A by-product of such action is the preservation of a carbon sink.

Core Capacity Building for Climate Change

China

China Council for International Cooperation on Environment and Development – The project assists China in developing integrated policies highlighting the critical linkages between environmental sustainability and economic and social development. It supports the China Council for International Cooperation on Environment and Development, a high-level non-governmental consultative organization which strengthens cooperation and exchange between China and the international community on environment and development.

Honduras

Natural Resource Management – This project seeks to build capacity for effective policies related to the sustainable management of natural resources including forests, agricultural land, water, and marine/coastal areas. Sub-components of the project focus on helping Honduras establish a focal point for participation in the Clean Development Mechanism and a Cleaner Production Centre, as well as sponsoring a study on energy-efficiency opportunities in Honduras.

India

Environment Facility – This umbrella project seeks to enhance Indian capacity to implement sustainable development activities in the water and energy sector. There are over 15 projects currently underway, a number of which have a climate change component (e.g., tree plantations, coastal wetlands, wind energy, etc.).

Indonesia

Collaborative Environmental Project – This project seeks to strengthen environmental policies and regulations, provide support to universities, and develop and demonstrate small projects for dealing with a variety of environmental issues.

Southeast Asia

Urban Environmental Management – This project aims to establish effective and sustainable environmental management educational programs and business services at the Asian Institute of Technology. It also provides opportunities for Canadian environmental companies to demonstrate technologies and services.

Adaptation

China

Hebei Dryland Project – This project develops and transfers ecologically sound dryland management technology and improves water efficiency, as well as balanced fertilization practices.

Indonesia

North Sulawesi Water Resources Institutional Development Project – This project aims to improve the management, design, construction, monitoring, and flood control for the water sector. This will contribute to increased capacity of local groups, such as the North Sulawesi Public Works Water Resources Unit and local affiliated groups, to adapt to climate change.

Mali

Environmental Rehabilitation and Food Security – This project builds capacity in local, decentralized institutions to deal with natural resource management and supports specific environmental interventions as they relate to both adaptation to desertification due to climatic changes and to improved food production.

Government of Canada

British Columbia

Alberta

Saskatchewan

Quebec

New Brunswick

Prince Edward Island

Nova Scotia

Yukon

Northwest Territories

Nunavut

NOTES

NOTES

For More Information

The Canadian Web sites listed below offer information on Canadian climate change programs and initiatives. Many also provide links to other climate change sites. Information is also available by calling tollfree 1 800 0-Canada (1 800 622-6232). For access outside Canada, please consult the Canada Web site (www.canada.gc.ca/directories/infor_e.html) for international toll-free numbers.

National Climate Change Web Sites

Government of Canada Climate Change Site	www.climatechange.gc.ca
National Climate Change Secretariat	www.nccp.ca
Environment Canada's Green Lane	www.ec.gc.ca
Natural Resources Canada – Climate Change Site	www.climatechange.nrcan.gc.ca
Agriculture and Agri-Food Canada	www.agr.ca/environ_e.html
Fisheries and Oceans: The Oceans' Role inClimate Change	www.meds-sdmm.dfo-mpo.gc.ca/sealane/climatechange/climatechangedeck_e/default.htm
Canadian International Development Agency	www.acdi-cida.gc.ca/index.htm
Clean Development Mechanism and Joint Implementation Office	http://dfait-maeci.gc.ca/cdm-ji
Health Canada	www.hc-sc.gc.ca/english/climate.htm
Industry Canada – Technology Partnerships Canada	http://tpc.ic.gc.ca
Transport Canada	www.tc.gc.ca/envaffairs/english/climatechange.htm

Provincial/Territorial Web Sites

Alberta	www.climatechange.gov.ab.ca/
British Columbia	www.elp.gov.bc.ca/epd/epdpa/ar/
Manitoba	www.gov.mb.ca/environ/index.html
New Brunswick	www.gnb.ca/elg-egl/index.htm
Newfoundland and Labrador	www.gov.nf.ca/env/labour/ohs/default.asp
Northwest Territories	www.gov.nt.ca
Nova Scotia	www.gov.ns.ca
Nunavut	www.gov.nu.ca
Ontario	www.ene.gov.on.ca
Prince Edward Island	www.gov.pe.ca/te/index.asp
Quebec	www.mrn.gouv.qc.ca
Saskatchewan	www.gov.sk.ca
Yukon	www.gov.yk.ca

Canada

For more information on Canada's climate change initiatives, visit the Government of Canada's climate change Web site **www.climatechange.gc.ca** or call the toll-free line **1 800 O-Canada (1 800 622-6232)**. For access outside Canada, please consult the Canada site **(www.canada.gc.ca/directories/infor_e.html)** for international toll-free numbers.

Pour de plus amples renseignements, veuillez visiter le site Web du gouvernement du Canada sur les changements climatiques **www.climatechange.gc.ca/french/html/index.html.** On peut aussi obtenir des renseignements en composant un numéro sans frais, le **1 800 O-Canada (1 800 622-6232)**. Les personnes habitant à l'extérieur du Canada sont priées de consulter le site du Canada **(www.canada.gc.ca/directories/infor_f.html)** pour y trouver la liste des numéros internationaux sans frais.